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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 12 JULY, 1930 NUMBER 1

THE APPLICATION OF MEDICAL AND SOCIAL SCIENCE TO THE PROBLEMS OF ACQUIRED DEAFNESS*

WENDELL C. PHILLIPS, M.D.

NEW YORK

The modern otologist in every civilized land is not contented to pause when his professional verdict of incurable deafness has been given. He is keenly interested in the general welfare of his deafened patient and in the inauguration of measures for his rehabilitation. He recognizes that the personal problem before him is psychologic as well as medical, and that it is a social as well as a psychologic problem. He realizes the importance of making a survey of the psychologic conditions and reactions to the handicap of acquired deafness in the case of each person—man, woman or child—found to have an incurable impairment of the sense of hearing.

DEAFENED PERSONS AS CRIPPLES

Defects of the hearing function in those who have from birth enjoyed normal hearing acuity mean a serious crippling of one of the major senses. The sense of hearing is the principal avenue for receiving instruction, warning and command, as well as for the free human intercourse which is the basis of government, education, the fine arts and commerce—in a word, of human society. The partial blocking or complete annihilation of this receptive mechanism, the hearing, whether it takes place gradually, during a few or many years, or whether it occurs, as in cases of auditory nerve paralysis, with apparently momentary destruction, must inevitably affect the mind and the behavior of its victim. The tragedy of acquired deafness lies in this baffling, conclusive and, above all, humiliating interference with free communication. The deafened child, unable to grasp what has befallen him, becomes seclusive and unsocial, loses rank in school and leadership in play, fails in his adjustment to family life and not infrequently becomes delinquent. The deafened adult withdraws from social relations and either falls in the social scale, or, in cleaving to his human rights, develops antisocial characteristics. In both child and adult there is a high degree of mental suffering.

* Submitted for publication, April 7, 1930.

* Read at the First International Oto-Rhino-Laryngological Congress, Copenhagen, July, 1928.

Such a person is actually and genuinely crippled, but his disability has the added disadvantage of leaving no outward sign, so that the casual observer has no way of understanding that the deafened person deserves as tender consideration as that which is so quickly aroused by the sight of the lame man's crutch or the blind man's black goggles and tapping staff. The deafened person's psychologic reactions are far from negligible; they are varied and numerous, and they fall into well known classifications. The otologist who studies the psychology of deafened persons recognizes it as unique and recognizes the man whose hearing has been impaired or lost as being truly classified among the cripples.

UNADJUSTMENT OF DEAFENED PERSONS

Failure to adjust themselves economically is the most striking characteristic of the deafened adults. Forty per cent must change their occupation, and many more must seek some other phase of their occupation if they are to continue to sustain themselves. The social inability of deafened persons to adjust themselves properly to the changes brought about by their handicap has been touched on; their lives may even be said to be devastated in very many cases, while every one, if he wishes to be honest, will admit some degree of failure and frustration. This unadjustment, with its waste of industrial, commercial and professional power, its transmutation of the richer resources of the human psyche into seclusiveness, despair and psychosis, is being met and conquered today in the United States through concerted efforts for rehabilitation.

REHABILITATION OF DISABLED PERSONS IN AMERICA

The movement for rehabilitation of disabled persons is a thing of yesterday in every civilized land. In America the theory had taken root before the World War, and the idea that those who were disabled possessed certain rights was already finding acceptance among individualistic people. During the World War, rehabilitation of disabled persons was brilliantly practiced in Europe, so that when the United States entered into the conflict American physicians had already profited by this experience, and they gratefully acknowledge their debt. Since 1918, Americans have continued to follow the work of the physician by that of the social worker, in consultation with the psychiatrist and in cooperation with the employer of labor.

Two types of disablement are especially noted: static cases, in which disablement will not increase, such as amputations of the arms and legs, victims of meningitis and poliomyelitis and the blind; and progressive cases, into which category most of deafened persons fall. Such patients must be so rehabilitated that any increase of their disability and consequent failure must be foreseen and guarded against.

AGENTS FOR REHABILITATION

Much rehabilitation work must necessarily be done by private social agencies, since they are able to study and experiment in advance of the government, but the adoption of a national system for rehabilitation of the disabled civilian assures permanency. Wisconsin, Minnesota and Massachusetts, closely followed by Illinois, New Jersey and New York, provided for the vocational retraining of those who were disabled. Federal legislation followed, and at the end of three years thirty-six states had begun operations. "Thus rehabilitation has been written into the public policy of the great majority of the states and the Federal government and the tradition of ages that the disabled are worthless, has been discarded."[1]

SPECIAL REHABILITATIVE MEASURES NEEDED IN CASES OF ACQUIRED DEAFNESS

It should be noted that all rehabilitative work in America is based on the principle that disabled persons should not be segregated for vocational training or in any other way. It is natural enough to establish schools for retraining those with a given type of handicap in some occupation which is theoretically appropriate, but this theory has been rejected. Because agriculture is a good occupation for those who are deafened, it would not be wise to establish a school of agriculture for deafened persons: (1) because individual tastes and aptitudes must be considered, and (2) because constant daily association with other deafened persons unfits these patients for mingling again, as they eventually must, with those who have normal hearing. The American State Bureau of Rehabilitation finds it more reconstructive to have disabled persons retrained in workshops where they meet and become accustomed to the conditions they will have to face as soon as training is finished and they are placed in new jobs. In the case of deafened persons this principle is particularly important, as it minimizes the tendency to seclusiveness which, if indulged, encourages the development of psychoses.

While 40 per cent of deafened persons are obliged to change their occupations, every person who suffers impairment of the hearing function requires certain rehabilitative assistance if he is to retain a normal psychologic attitude. Seclusiveness and the peculiar desperate loneliness which arise from the inability to communicate freely and casually with other human beings must be combated. Instruction in lip reading, particularly if given in one of the free evening school classes now available in many American cities, is the best weapon against seclusiveness and

1. Sullivan, Oscar M., and Snortum, Kenneth: Rehabilitation of Disabled, New York, Century Company, 1926.

loneliness. A suitable hearing aid, of which there are now many adapted to different types of deafness, should be used, and the person's natural repugnance to it should be overcome (figs. 1 and 2).

Vocational retraining should be obtained when indicated, and should be followed by placement where the employer has been won over to the definite advantages of the deafened worker, who seems to possess unusual power of concentration.

The deafened man or woman must be guided into the understanding that future successful readjustment depends to a degree on acceptance of the handicap and an attitude toward the hearing world as free as possible from envy and suspicion. When rehabilitated, such a person

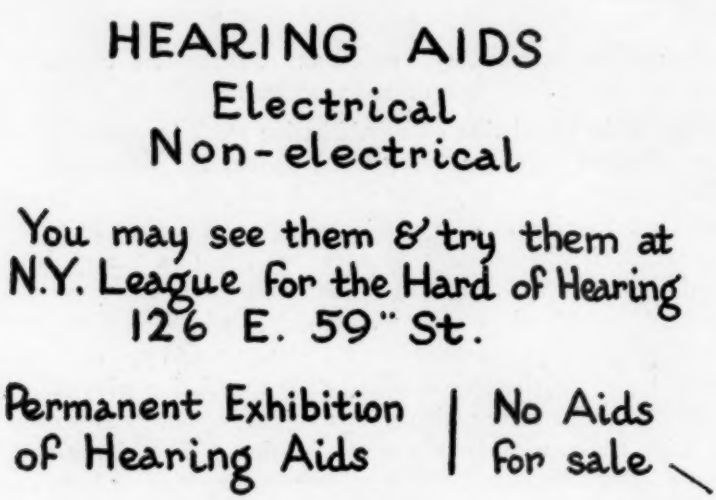
HEARING AIDS
Electrical
Non-electrical
You may see them & try them at
N.Y. League for the Hard of Hearing
126 E. 59" St.
Permanent Exhibition of Hearing Aids
No Aids for sale

Figure 1

will find himself the recipient of a remarkable degree of courteous sympathy from people with normal hearing, who will be more than willing, as a rule, to allow him to make good in his chosen field (fig. 3).

THE AMERICAN MOVEMENT OF DEAFENED PERSONS IN COOPERATION WITH OTOLOGISTS

The American otologist has ready to his hand a strong mechanism for the rehabilitation of his deafened patients in the American Federation of Organizations for the Hard of Hearing, which embraces more than sixty local organized groups, and corresponds with similar organizations in the British Empire, France, Holland and the countries of Central Europe. The Federation has the formal approval and the active cooperation of the American Medical Association, the American Otological Society, the American Laryngological, Rhinological and Otological

Fig. 2.—A hearing aid interview at the New York League for the Hard of Hearing, which displays various types of hearing devices from the League collection.

Fig. 3.—The deafened architect's plan for the new court house has won the competition, and he is the last person in the office to know it. (Taken from "Lines Down.")

Society, the Academy of Ophthalmology and Oto-Laryngology and numerous otological bodies.

The National Education Association, the National Conference of Social Work, the National Research Council and other national societies in the allied fields of medicine, social work and education are also cooperating. Otologists, physicists and educators share the Federation leadership with prominent deafened people, and its influence is already widespread. Its annual conferences attract the cooperation of distinguished men of science and its published "Proceedings" are helping to build up a valuable literature pertaining to acquired deafness.

Fig. 4.—Hearing over a group audiophone.

The American Federation of Organizations for the Hard of Hearing had its origin within the pioneer organization for the deafened—The New York League for the Hard of Hearing, founded in 1910 by a deafened teacher of lip reading to take care of the social and psychologic problems which were constantly presented to him. This first organization has continued to be the leader and model for later groups, serving as it does deafened persons of all ages, without restriction of condition, race or religion, of a population of 10,000,000 (fig. 4).

It is perhaps without precedent that such a movement should have been developed by a group of handicapped people working in behalf of their fellows and able to attract the cooperation of scientists.

The local organizations comprising the Federation are highly individual, as might be expected in a country so devoted to individualism, yet they are heartily united in one general program, a program that has

two main divisions: (1) rehabilitation of the deafened child and adult; (2) prevention of deafness. In the latter aim, which the deafened leaders see as the inspiring motive power of the movement, Americans acknowledge a grateful debt to the great Scotch otologist, James Kerr Love of Glasgow. These unit organizations are gradually developing professional personnels, who are in turn training social workers for this special work, both as their own junior assistants and as executives of younger organizations. A few notable textbooks and pamphlets have already been produced, such as "Ears and the Man, Studies in Social Work for the Deafened,"[2] "Lip Reading for the Deafened Child,"[3] "Lines Down,"[4] and a number of informative papers to be found in the

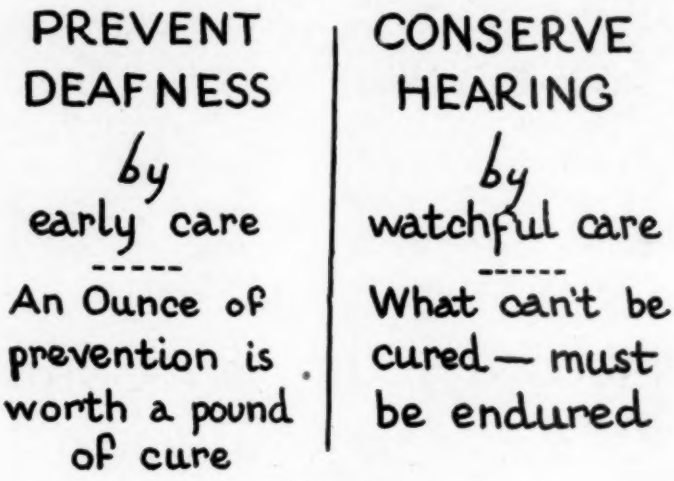

Figure 5

"Proceedings of the American Federation of Organizations for the Hard of Hearing"[5] (fig. 5).

It should be noted that none of these organizations include the congenitally deaf among their members, nor do they work with the congenitally deaf, although they are in cordial agreement with the objectives of such societies as the American Association to Promote the

2. Peck, Annetta W.; Samuelson, Estelle E., and Lehman, Ann: Ears and the Man, Studies in Social Work for the Deafened, Philadelphia, F. A. Davis Company, 1926.

3. Stowell, Agnes; Samuelson, Estelle E., and Lehman, Ann: Lip Reading for the Deafened Child, New York, The Macmillan Company, 1928.

4. New York League for the Hard of Hearing: Lines Down.

5. Proceedings of the American Federation of Organizations for the Hard of Hearing, Washington, D. C., Volta Bureau.

Teaching of Speech to the Deaf, and the Society of Progressive Oral Advocates. The former counts many deafened persons among its members.

PREVENTION OF DEAFNESS

Realizing that acquired deafness must be discovered at its onset if it is to be arrested, and that most deafness of this type has its origin in early life, the American Federation of Organizations for the Hard of Hearing has adopted a program of public education and information. This includes magazine and newspaper articles, as well as the bulletins published by each local organization and the long-established *Volta Review* published by the Volta Bureau of Washington, D. C., in the

Figure 6

interests of teachers of the deaf and also of the hard of hearing and their friends. During the first week in May, which American schools, parents, health workers and physicians know as "Child Health Week," organizations for deafened persons emphasize the care of the child's hearing by means of addresses, radio broadcasts and special press articles (figs. 6 and 7). At all times of the year they promote and assist in the instruction in health in schools, social centers, etc., on topics relating to general health, aural hygiene and the avoidance of quacks and quackery (figs. 8 and 9).

The organizations are also promoting, and in many cases are undertaking surveys of schools for the discovery of incipient impairment of hearing. This has been made possible in recent years by improved methods of testing in groups through the development of the phonograph audiometer by the Bell Telephone Laboratories of New York. Children

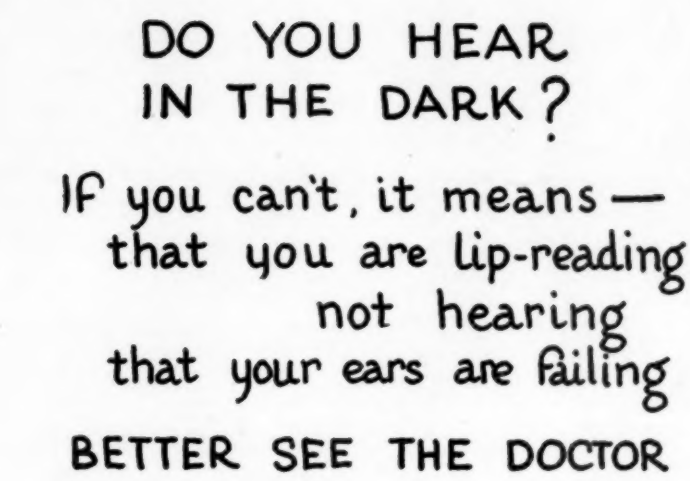

Figure 7

Figure 8

found to be hard of hearing by the group audiometer test are referred to the otologist for individual testing and examination. Many of these impairments of hearing are due to remediable conditions, and as parents come to realize the seriousness of the handicap of deafness, otologists and social workers will receive better cooperation from them. At present the discovery that 12 per cent of elementary school children, or a probable total of 3,000,000 in American schools, have defective hearing, constitutes a great educational problem. This problem is being met in a constantly growing number of cities by a simple plan which has already had convincing proof. This plan provides lip reading in the elementary

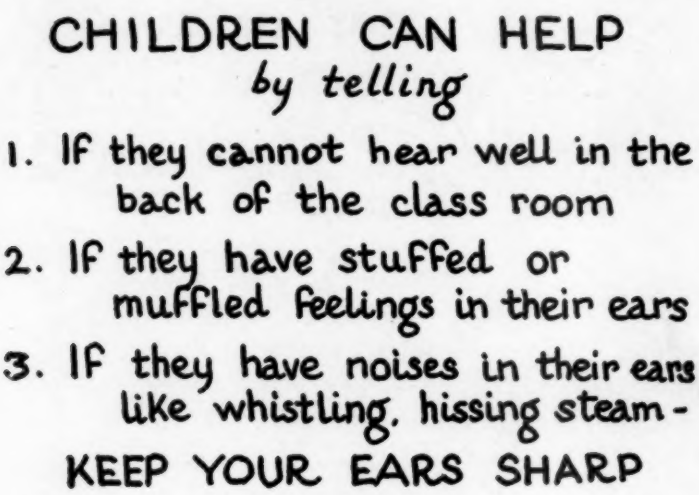
CHILDREN CAN HELP
by telling
1. If they cannot hear well in the back of the class room
2. If they have stuffed or muffled feelings in their ears
3. If they have noises in their ears like whistling, hissing steam -
KEEP YOUR EARS SHARP

Figure 9

schools, in a normal environment where the childrens' playtime is spent with children with normal hearing. Such children acquire lip reading rapidly. They make their promotions without difficulty, and they proceed through the secondary schools and college, if their ambitions carry them so far; if they go to work instead of to high school, they have no difficulty in sustaining themselves, provided wise choice of a vocation is made. These young lip readers, trained in a normal environment, show none of the psychologic stigmas of deafness, and are rather envied by their playmates with normal hearing for their possession of a superior faculty. Their lip reading enables them, as well, to surmount or to ignore any increases of deafness which may come in adolescence or later (figs. 10, 11 and 12). The importance of wise vocational guidance for the child who is hard of hearing is deeply heeded by the workers in organizations for deafened persons.

Fig. 10.—Free class, rapid fire lip reading practice in the educational department of the New York League for the Hard of Hearing. These children are making good in their regular school work. (Taken from "Lines down.")

Fig. 11.—A library after the lip reading hour.

FUTURE NEEDS AND HOPES

If physicians are to solve the problem of the various types and forms of acquired deafness, science must find its way to victory through the gateway of research, and the lines to be followed in the research problem must be both clinical and laboratory.

Clinical Research.—Clinics for diseases of the ear, in general, deal specifically with the treatment for such diseases; they care only for patients who voluntarily seek relief. They are usually overcrowded and the time of the otological attendants must be fully devoted to the treatment for the disease. In these clinics very little time is permitted

Fig. 12.—School children having their hearing tested by means of the phonograph audiometer.

for investigation. It is possible that by reorganization a good deal might be accomplished along the lines of research even in clinics of this kind. But clinics devoted solely to prevention and research are necessary, and they must be organized more along laboratory lines, where full-time men may be permitted to devote their entire energies to research clinical investigations. The ordinary clinical case records can in no way fulfil the requirements of the case records needed to meet the demands of research. The limited investigations regarding the hearing of school children have shown clearly that thousands of these children have hearing defects for which no medical advice has ever been thought necessary, either by parent or by teacher. Such patients may never be expected to consult otologists or to visit clinics for diseases of the ear

until deafness forces them to go. Nevertheless, these are the very children who should form a large percentage of those to be investigated under the auspices of the research clinic. This particular type of patient should constitute the chief source of material to be handled by the research clinic.

Several such clinics have been conducted in the United States on a small scale by otologists who, unselfishly, are willing to sacrifice their time for a great cause, even without the necessary financial backing. Even these small scale clinics, a short time in existence, have already shown amazing conservation results.

Laboratory Research.—For many years individual otologists in various parts of the world, especially men possessing the investigating spirit, have devoted a good deal of study to the laboratory phases of deafness. These studies have been more or less sporadic and have lacked proper financial support. Recently, however, considerable organized and properly financed effort has been made, notably by the American Otological Society and the Department of Pathology of the Johns Hopkins Hospital in Baltimore. These organizations have considerable financial support. No doubt similar efforts are being made in other parts of the world. All this is necessary, but it seems imperative in order to advance the cause of otological research at a reasonably rapid rate that a world survey should be made in order that the full status of the problem may be fully ascertained and formulated. Such a professional survey is now being made in the United States covering all medical, educational and social-economic features of the hearing problem, with a view to the establishment of a great foundation for research of sufficient proportion to meet every needed demand for research.

30 East Fifty-Eighth Street.

DECALCIFICATION OF TEMPORAL BONES

THE USE OF X-RAYS FOR DETERMINING WHEN DECALCIFICATION IS COMPLETE *

E. W. HAGENS, M.D.
Friedberg Fellow Otolaryngology, University of Chicago
CHICAGO

In the decalcification of temporal bones, two important questions arise: 1. Which decalcifying fluid is best? 2. How can one know when the bone is actually decalcified?

It is frequently stated that 5 per cent aqueous nitric acid is the most suitable decalcifying fluid. The temporal bones are placed in this solution, and fresh changes are made every few days until the bones are decalcified. Other acid solutions that have been used are hydrochloric acid and sulphurous acid. When hydrochloric acid is used, however, the outer parts of the bone seem to become so disintegrated that they are frequently lost. It has been my experience that even 5 per cent nitric acid solution in 70 per cent alcohol produces dissolution of the outer parts of the bone before the central part is decalcified. Thus, valuable tissue and landmarks are often destroyed. From 1 to 2 per cent nitric acid has been found satisfactory and preserves the bone intact, though taking longer. The solution found most satisfactory, then, consists of from 1 to 2 per cent nitric acid in 70 per cent alcohol. An aqueous solution is not used because of the liability of maceration. For an adult temporal bone, fixed in formaldehyde, about from three to four months are necessary for decalcification.

In considering the question of knowing when the bone is completely decalcified, it has usually been recommended that a needle be used. The needle is introduced into the tissue in various places, and if no bony or grating resistance is encountered, the bone is considered decalcified. This method has long been used in temporal bone work. However, considerable experience and judgment have been necessary as the needle could not be passed through certain parts of the temporal bone without injuring the membranous labyrinth. Unfortunately, the densest bone is located just adjacent to the soft labyrinth. Therefore this region is apt to be undecalcified and to remain undetected until sectioning reveals it. The needle passing through the more peripheral parts of the bone would not strike hard bone, and because of fear of

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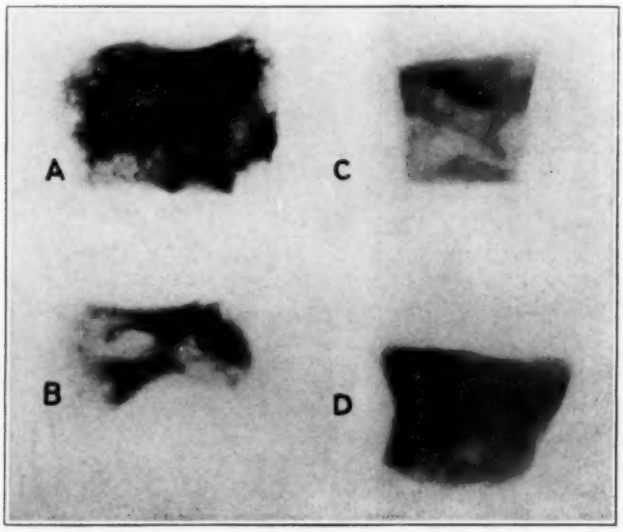
* Read before the Chicago Laryngological and Otological Society, March 3, 1930.

injuring the labyrinth, it would not be inserted at the place or places where undecalcified bone could be expected to persist. I have frequently had this unfortunate experience. It is true that such a bone may again be decalcified to soften such a focus. However, this is unsatisfactory, as the newly decalcified focus will not be embedded and will therefore come out like sawdust. One may re-embed to circumvent this difficulty, but when the total loss of time and possible destruction to the tissue from a second process are considered, it is easy to see that to prevent such an accident would be infinitely better.

Another method of determining complete decalcification has been described by A. Williams in the *Dental Cosmos,* July, 1927. The method consists of detecting phosphoric acid in the decalcifying fluid. The phosphoric acid results from the action of the nitric acid on the bone. Thus its presence indicates incomplete decalcification. The reagent used for testing combines with the phosphoric acid to produce the precipitate, ammonium phosphomolybdate, which is thus seen. At the suggestion of Dr. R. Bensley of the University of Chicago, a modification of the test was carried out. Five cubic centimeters of 10 per cent aqueous nitric acid was placed in a test tube. To this was added 1 cubic centimeter of 1 per cent ammonium molybdate and 1 cubic centimeter of 2 per cent phenylhydrazine hydrochloride. About 15 cubic centimeters of the decalcifying fluid was then evaporated to dryness and the residue redissolved in several cubic centimeters of distilled water. This water solution was added to the reagents in the test tube. When phosphoric acid was present in the decalcifying fluid, the solution in the test tube turned a deep blue, whereas in the control tube or when the fluid did not contain the acid, the solution became a yellowish orange. The blue in the test tube is produced by a blue oxide of molybdenum, and is much more delicate than the end-result in the unmodified test. While this method is worth while, there are several disadvantages: 1. It is so delicate that decalcification would probably be carried on longer than would be necessary for ordinary cutting and staining. 2. It is possible that undecalcified bone areas could be present and the decalcifying fluid have no free phosphoric acid at the time tested. (Williams in his article stated that he has found minute areas of undecalcified bone after testing by this method.) 3. The method requires a certain amount of time (when aqueous nitric acid is used, the evaporation to remove the alcohol is not necessary, thus simplifying the procedure). 4. When the presence of phosphoric acid is found by this method, it is not possible to tell how much or how little undecalcified bone is present, and so frequent testing may be necessary.

In looking for a more satisfactory method, I decided to try the use of x-rays. This had been suggested several times, but never thought

of seriously. The results of the experiments, however, have shown that the x-ray picture reveals at once whether or not a bone is decalcified. An x-ray picture of a temporal bone ready to be decalcified shows the dense bone about the inner ear or labyrinth and the lighter bone more at the periphery. After some weeks of decalcification, the bone reveals the area about the labyrinth to be less prominent and the borders to be less dense. When all of the bone is decalcified, except a certain region, the latter shows itself as a definite focus. The completely decalcified bone casts a smooth, faint shadow, as shown in the accompanying figure.



A represents a temporal bone ready to be decalcified; *B*, shows a temporal bone after five weeks' decalcification; *C* shows a focus of bone persisting after three months' decalcification; and *D* shows complete decalcification.

The bones showing foci on roentgen examination have been cut into, and undecalcified bone has been found in the areas shown by the roentgenogram. Redecalcification has caused these foci to disappear on roentgen examination. Temporal bones showing complete decalcification in the roentgenogram have been sectioned, and no undecalcified bone has been found. The chemical test, as already described, was used to check the results seen in the x-ray picture. The observations agreed in each instance, although the chemical reaction was positive for some days after the roentgenogram had showed complete decalcification. This was because the extraction of phosphoric acid lags behind the decalcification process.

Thus I am convinced that by the use of the x-rays it is quickly determined when a temporal bone is decalcified. It is easily shown just how far the process has progressed and how soon complete decalcification may be expected. This process is so simple and accurate that the method may save valuable temporal bones from haphazard treatment, with possible loss of important time and information.

The technic of the roentgen examination was carried out by Mr. R. D. Bensley of the University of Chicago. The bones were placed on the film and exposed for four seconds. The target distance was 20 inches, the amperage, 18 milliampere, and the spark gap, 3⅝ inches. Of course, for the most accurate definition variations in the exposures were necessary, but for the determination of the presence or absence of undecalcified bone, extreme accuracy was not required.

A CONSERVATIVE TREATMENT OF CHRONIC MAXILLARY SINUSITIS *

HOMER A. TROTTER, M.D.
BUFFALO

The after-effects of the radical maxillary sinus operation may be serious. Anesthesia of the cheek may occur if the incision is extended too far toward the middle line, injuring the anterior dental nerve supply. Devitalization of the teeth may occur owing to nerve injury. Infra-orbital neuralgia results if the periosteum is elevated too high and the infra-orbital nerve injured. Aspiration pneumonia has been known to occur following general anesthesia. Therefore, I desire to make a plea for more conservative measures.

If the after-effects of radical procedure can be eliminated by a more conservative method of treatment and the removal of pathologic tissue be obtained with less destruction of tissue, this method should be given consideration.

The surgical treatment for chronic maxillary sinusitis may be considered radical or conservative, depending on the pathologic process found. Each case presents its characteristics, and treatment should be given to meet the requirements of the case. Some cases require radical procedure, especially when chronic changes occur in the mucous membrane. In the treatment of surgical conditions, one should endeavor to secure the maximum of repair with the minimum of tissue destruction.

In this article I aim to describe a conservative method of treatment that I have used for the past two years. Ten patients have been operated on with apparent success. Failure to find a report in the literature concerning this method indicates that it is new and undoubtedly interesting. First of all, it depends for its success on intelligent antroscopy.

Antroscopy may be defined as the process of investigating the interior of the antrum of Highmore by means of an instrument known as the antroscope. The practice of antroscopy is as important in arriving at a diagnosis of antral disease as cystoscopy is in arriving at a diagnosis of bladder disease.

The urologist will never definitely diagnose a condition of the bladder or give treatment unless he has first obtained a good view of the interior of the bladder by a cystoscopic examination. The cystoscope is indispensable in the diagnosis and treatment of a bladder disease. The rhinol-

* Submitted for publication, April 7, 1930.

* Read before the Buffalo Triological Society, Nov. 12, 1928.

ogist has, it seems, fallen by the wayside in the use of the antroscope. It is used by a few, but the majority cling to the older methods of diagnosis.

The rhinologist will often diagnose, treat and maltreat an antrum without having a true conception of the pathologic process on the interior. The most important asset is the accurate knowledge of the pathologic condition present, so that the proper treatment can be given; thus full use should be made of the antroscope.

METHODS OF DIAGNOSIS

Ordinary diagnosis of a case of chronic maxillary sinusitis may be described as follows:

1. The clinical history and symptoms are to be given careful consideration, and the nose examined for pathologic processes such as deviated septum, hyperplastic turbinates and polypoid growths. If a discharge is present, an examination is to be made to determine its source. The antrum may become a reservoir for discharge from sinuses above and become chronically diseased. It is obvious that before the maxillary sinus can be cured, the involved sinuses higher up must be treated. An investigation of the faucial and pharyngeal tonsils should be made, and if diseased, they should be removed. A careful examination of the dental structures should be made for apical abscesses.

2. Transillumination is an aid to diagnosis, but is of slight value.

3. Diagnostic puncture of the maxillary sinus and washing can be of value in some cases and of little assistance in others.

4. The roentgenogram offers valuable aid in the diagnosis of chronic maxillary disease and is one of the reliable agents.

5. The injection of iodized oil frequently helps in diagnosing and treating an antral pathologic condition in which the ordinary roentgen observations are uncertain.

6. The antroscope offers valuable and reliable aid in the diagnosis of antral conditions. The use of the bronchoscope by Jackson and others has performed wonders in diagnosis and successful treatment. The use of the antroscope ought to be added to these, because it alone gives a true picture to the investigating eye.

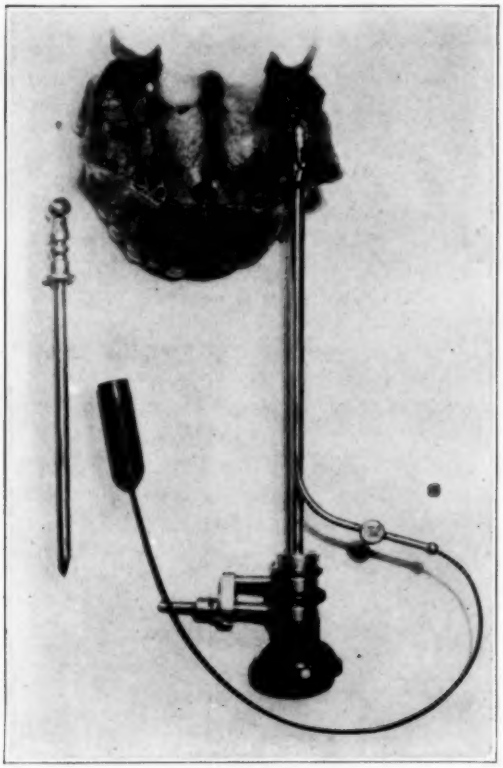
ANTROSCOPY

History of the Antroscope.—In 1903, Hirschmann constructed an instrument analogous to Nitzche's cystoscope, and it was used in Hajek's clinic. Reichert described an instrument of his make which he calls an antroscope.

Technic.—1. Nasal Route (Diagnostic): The anterior one third of the inferior meatus is snugly packed with a piece of cotton saturated with 2 per cent procaine hydrochloride solution with epinephrine. After ten minutes, a Meyrowitz trefining drill is used to perforate the naso-antral wall. It is inserted into the inferior meatus close to the inferior turbinate at its junction with the outer nasal wall. The angle of insertion should be about 30 degrees to the outer nasal wall,

which should be punctured as high as possible and anteriorly. Into this circular opening a trocar and cannula is inserted. After the antrum has been entered, the trocar is withdrawn, the antroscope introduced through the cannula into the antrum, and the latter inspected.

2. The Canine Fossa Route (Diagnostic and Operative): After an infiltration of 1 per cent solution of procaine hydrochloride into the mucous membrane over the thinnest portion of the canine fossa or the blocking of the infra-orbital nerve as it emerges from the infra-orbital foramen, a short incision is made in the mucous membrane. The trocar and cannula are directed into the antrum by



The canine fossa route (diagnostic and operative), showing the antroscope, electrode carrier, and electrode in position, passing through the canine fossa into the maxillary sinus. The trocar and cannula are to the left.

striking the head of the trocar with a mallet. The trocar is removed, the antroscope introduced into the sinus, and the interior inspected. By rotating and rocking the antroscope, the entire antral wall can be observed, including the apex, which is impossible by the nasal route.

The Image.—If provided with an achromatic lens of good make, the antroscope produces an image which is clear and distinct. The image is to the right and upright. The cannula is necessary in making an

examination because it protects the lens from being soiled with blood. The cannula can be used for irrigating purposes. In addition to the antroscope and chiefly by means of it, an electrode may be introduced to desiccate the pathologic parts.

SURGICAL DIATHERMY

The failure to grasp electricity for therapeutic uses can be laid to prejudice, which is justified by the exaggerated claims made by electrotherapeutists and others in years gone by. At the present time, however, the real value of electrodesiccation and electrocoagulation is appreciated and used by dermatologists, urologists and surgeons.

The high frequency, bipolar current is suitable in the treatment of some diseases of the maxillary sinus, especially granulations, polypoid degeneration, malignant conditions, tumors, new growths and cysts. It prevents spark jumping, gives a more penetrating action by the endogenous heat, and the current is more intense, producing coagulation.

Surgical Technic.—The antroscope should be properly placed in the maxillary sinus by the route of choice and a diagnosis made.

If the diagnosis should be maxillary empyema with polypi, a malignant condition, etc., the sinus should be washed with physiologic solution of sodium chloride, followed by the injection of a solution of 2 per cent cocaine and epinephrine chloride. The opening into the sinus may be slightly enlarged to permit the entrance of the electrode carrier with the antroscope. The electrode should be placed one-quarter inch in advance of the lens. The electrode is introduced into the pedicle of the polyp or mass or base of the tumor, and a moderately strong current is allowed to pass until desiccation has occurred. This procedure is to be repeated in as many areas as may be necessary. If the base or attachment of the polyp is hidden from view, the overlying parts are first desiccated until the attachment can be seen and treated. It is advisable to desiccate a small area of mucous membrane about the base of the tumor. The areas treated will slough in a day or two, and occasionally a trace of bleeding during the separation of the slough will be experienced. The antrum should be washed daily with a saturated solution of boric acid to remove the slowly separating slough and cellular débris. An occasional irrigation with 0.5 per cent silver nitrate solution is helpful in certain cases. The separation of the slough may be hastened by using a solution of pepsin, which will digest out all tissue destroyed by the current and will leave a clean, granulating wound.

In all cases it is advisable to make a counter-opening window in the naso-antral wall as low as possible, which should be permitted to close as soon as healing is assured; also when a fistula through the alveolar process persists and a graft has to be made to close the antrum, this counter-opening is of assistance.

The advantages of surgical diathermy are many, viz: The wound is sterilized; the operation is bloodless; secondary hemorrhages are rare; shock is less; postoperative discomfort is negative, and convalescence is rapid.

When perfect control of the current is obtained, the most delicate tissues can be treated, and, if necessary, bone can be destroyed completely or a thin sequestrum be caused to form, according to the intensity of the current and the time it is allowed to act. By this method the complications that may follow radical surgical procedures are entirely eliminated, as are also serious after-results, such as aspiration pneumonia, secondary hemorrhage, disturbance of the lacrimal apparatus, anesthesia of the cheek, anesthesia of the nerves of the teeth and infra-orbital neuralgia.

CONCLUSIONS

I have treated ten patients with chronic maxillary sinusitis complicated with polypoid degeneration since developing this method of treatment. At the present time, the results are satisfactory and the patients apparently cured.

Dental roentgenograms should be taken to determine the position of projecting molar roots into the antrum should they occur.

The antroscope was originally used through the naso-antral wall, but experience has convinced me that the approach through the canine fossa is in every way preferable. It is more agreeable to the patient, easier for the operator and provides a good view of the entire antral cavity.

I am of the opinion that roentgenograms and the antroscope are the best methods of antral diagnosis, and in conjunction with electrocoagulation give an intelligent, conservative treatment for chronic maxillary sinusitis.

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ASPHYXIA

TREATMENT IN THE ADULT AND IN THE NEW-BORN *

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NEW YORK

The methods now available for the treatment in cases of asphyxia or respiratory failure fall into four groups: (1) manual and postural, in which the cubic capacity of the chest is automatically increased and diminished by direct pressure on it with manipulation of the extremities (Sylvester) and by the prone pressure method (Schaeffer); (2) the negative pressure chamber as described and used by Drinker;[1] (3) the blind introduction of air or oxygen under pressure into the mouth (by lung motor or pulmotor), pharynx (Meltzer[2]) or trachea (by direct intubation, as recently described by Dr. Matthew and Dr. Holman), and (4) direct inspection of the field by the laryngoscope, aspiration under vision of both pharynx and trachea, intubation and intratracheal insufflation of a known volume of oxygen and carbon dioxide under measured pressure.

Asphyxia or respiratory failure demands the application of resuscitation by the layman as well as by the physician. Since the layman is present in the usual case of asphyxia from smoke, gas, poisoning, electrical shock and submersion before the physician appears on the scene, every effort should be made to popularize first aid methods of resuscitation among this personnel.

The extensive and varied experience of the police and fire departments, as well as that of the gas and electrical companies, with their highly trained groups, presents an ideal for the less skilled layman. This work is to be enthusiastically recommended and broadcast through every possible channel. The judgment of these groups is that the Schaeffer prone pressure method is the most satisfactory emergency method of resuscitation; this should be supplemented, as occasion offers, by the inhalation of oxygen and carbon dioxide (5 per cent), positive and negative pressure being avoided.

The recent adoption of the Drinker negative pressure cabinet, which may be operated by hospital technicians, has proved of value, especially in those patients who are conscious but unable to carry on their own respiration.

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* Submitted for publication, March 4, 1930.

1. Drinker, C. K.: Acute Asphyxia as Medical Problem, J. A. M. A. **90**: 1263 (April 21) 1928.

2. Meltzer, S. J.: Resuscitation, M. Rec. **92**:1 (July 7) 1917.

It is evident that these methods available for lay use should be familiar to the intern, physician and dentist.

The limitations of these methods, however, become at once apparent to the physician when he is confronted by the unconscious, completely relaxed, apneic patient, whether the condition is due to carbon monoxide poisoning, submersion, the effects of smoke, the familiar intramural emergencies of anesthesia, laryngeal obstruction from foreign bodies, or drug poisoning, as from morphine, scopolamine hydrobromide and cocaine, or in the large group of cases of asphyxia neonatorum, which present the supreme test of the delicacy and precision of any method of resuscitation.

In these emergencies, to call on or to permit lay persons to treat patients by a lay method in an operating room is a reproach to present-day methods of resuscitation by the physician, and an admission of professional incompetence which may assume serious proportions when traumatism results from ill advised and protracted treatment. The physician, as part of his intensive training, is obligated to avail himself of all known modern methods which may relieve respiratory obstruction and stimulate and support the respiration and the circulation.

Mechanical appliances that provide negative pressure are taboo. Positive pressure machines delivering air or oxygen by means of a mask are inaccurate, do not take respiratory obstruction into account, and frequently act in opposition to the patient's reestablished respiratory rhythm.

Indirect intubation by catheter, whether in the adult or the newborn, corresponds closely to the intubation technic of O'Dwyer which, while invaluable fifty years ago, has now given place to direct methods, as advocated and practiced by Dr. Chevalier Jackson.

The negative pressure cabinet, as employed by Drinker, has given splendid results. It is well adapted to the conscious patient whose respiration is to be supported over long periods. Its efficiency would be perfected by exposure of the pharynx, examination and intubation.

There is no good reason, however, why every physician should not be trained to examine the pharynx and the larynx of the unconscious, relaxed patient. Under such exposure, foreign matter may be removed by suction directed to the desired spot; a tube may be introduced into the glottis, and oxygen and carbon dioxide delivered to the patient in the correct volume and under measured pressure.

A suitable apparatus to carry out this technic was described and illustrated by me in the *Journal of the American Medical Association*.[3]

3. Flagg, P. F.: Treatment of Asphyxia in New-Born: Preliminary Report of Practical Application of Modern Scientific Methods, J. A. M. A. **91**:788 (Sept. 15) 1928.

The equipment described became immediately available for adult use by the addition of large intratracheal tubes. As described in detail in a previous report, I have kept the necessary apparatus down to what I believe is an irreducible minimum. The paraphernalia used for exposure and aspiration are generally accepted as simple. The complications of the method revolve about the question, Is it essential to insufflate oxygen and carbon dioxide under measured pressure, or will air or oxygen from a convenient source under a pressure estimated by the operator by the means at hand—his own breath or oxygen tanks—suffice?

A number of surgeons have felt that the gas tank, reducing valve and manometer were an unnecessary annoyance and expense. They have tried resuscitation in the new-born, omitting these elements, and after a number of trials they have found that the reaction of the patient proved that he was not getting what he was entitled to, namely, the specific stimulating effect of carbon dioxide with oxygen. There has been but limited experience and practically no check-up to bring out the probable danger of unmeasured pressure. However, it would seem that physiologic experiments in this field should meet this question; namely, that it is unsafe to increase the intratracheal pressure in the new-born beyond 25 mm. of mercury. When it is recalled that the forceful expiration of the adult delivers a pressure of from 60 to 80 mm., one may imagine the damage that enthusiastic intratracheal insufflation by mouth may cause. As a resident surgeon of one of the city hospitals said recently (February 15):

> When I first saw this apparatus, I thought it was a lot of junk, but I soon learned that some babies do not just breathe or die; they can be helped and saved by aspiration and insufflation.

Owing to the confusion attendant on resuscitation, however, the brief nature of its application and the lack of late sequelae, it seems more than especially difficult to secure good histories. Among the instances of successful resuscitation, accomplished to date, are the following cases, each of which is characteristic of a class; namely, drug poisoning, laryngeal obstruction from foreign bodies and asphyxia neonatorum. In cases 1 and 3, the resuscitations were performed by me, and in case 2 by the house staff.

REPORT OF CASES

Case 1.—*Morphine Poisoning.*—As preoperative medication, a girl, aged 17 years, received three phenobarbital tablets during the night and morphine, ⅙ grain (0.011 Gm.), and atropine, 1/150 grain (0.004 Gm.), before a tonsillectomy, which was performed at 9 a. m. (I did not attend this operation.)

An emergency call was received at 12:45 p. m. I found the patient unconscious, receiving oxygen; a shallow respiration occurred once every thirty or forty

seconds. The color was gray, and the limbs were flaccid. The patient was placed across the bed, and her larynx was exposed without difficulty. There was a slight laryngeal reflex on the passage of a suction tube, which had been wet with alcohol. The pharynx and the larynx contained some blood and mucus, but were not greatly obstructed, Insufflation of oxygen and 10 per cent carbon dioxide was begun immediately with an infant insufflation tube. The patient's color improved promptly. Respiratory efforts increased; the respirations were rapid and shallow, slowing to ten a minute within five to seven minutes. Insufflation was then applied intermittently. Strychnine, 1/30 grain (0.021 Gm.), and caffeine, 2 grains (0.13 Gm.), were given hypodermically during insufflation. An adult insufflation tube was introduced against slight spasm. The oxygen tank was exhausted in fifteen or twenty minutes. I sent a man for a second tank, installed this, and commenced the insufflation once more. The patient's color became cyanotic, respiration fell, and she was not doing well. Investigation revealed that a nitrous oxide tank had been substituted for an oxygen tank. Insufflation was immediately discontinued, and the patient was allowed to breathe through the tracheal tube. While a messenger was being despatched for an oxygen and carbon dioxide tank, pure oxygen was insufflated with practically no stimulating effect. When insufflation with oxygen and carbon dioxide was reestablished, respiration and color immediately improved. At the end of ten or fifteen minutes, the laryngeal reflexes returned, the tube was gripped by the larynx and restless motions of the head began. At the end of five more minutes, the patient moved her arms about and began to object to the presence of the laryngoscope. This was then withdrawn, suction was applied, and the intratracheal tube was removed against marked resistance. At this time, the patient was recovering consciousness rapidly. The pharynx and larynx were once more exposed; the reflexes were found to be normal. The patient was replaced in bed, and within a few minutes was exchanging remarks with the surgeon. By 2:15 the patient had recovered completely.

It was observed that promptly after resuscitation with oxygen and carbon dioxide was begun, a very rapid and shallow respiration could be heard taking place through the intratracheal tube. This appeared to another observer as a cardiac impulse. I believe, however, that it was a true respiratory effort brought about by a minimum central reaction. It is felt that this very shallow, rapid respiration is in keeping with the very shallow respiration preceding respiratory paralysis; that this phenomenon is not generally observable because of the obstruction presented by the upper airway; that the usual solitary respiratory effort which one observes in such a patient is merely the cumulative effect of these efforts, due to the accumulation of carbon dioxide, and that in the presence of anoxemia, this respiratory effort usually fails to resuscitate the patient. This phenomenon is in keeping with that observed in case 3.

The accidental insufflation of nitrous oxide and the insufflation of pure oxygen during the interval between the use of oxygen and carbon dioxide clearly demonstrated the specific effect and advantage of carbon dioxide.

CASE 2.—*Laryngeal Obstruction.*—A white girl, aged 6, was admitted to the hospital on Nov. 11, 1928, with a history of having aspirated a nut about 0.5 cm.

in diameter on November 6. Bronchoscopy was performed on November 13. Several attempts to remove the nut were unsuccessful because it was pulled out of the grasp of the forceps as it reached the vocal cords.

After one of these attempts, the nut became so lodged in the larynx that the child's airway was completely shut off. She quickly became cyanotic and the jaws were tightly clenched in a masseteric spasm. In about two minutes the skin became mottled, cyanotic and pallid in patches, and the jaws relaxed. At this point, the light of the laryngoscope failed completely.

During the time that the patient was strangling, the junior intern set up the resuscitation apparatus. The small Flagg laryngoscope was given to the operator, who then exposed the glottis and reintroduced the bronchoscope into the trachea, pushing the nut before it. The tube supplying the oxygen and carbon dioxide was then connected to the tube on the bronchoscope that is ordinarily used for suction.

After about thirty seconds of resuscitation, the patient's color became pink. About sixty seconds later, rapid, shallow respirations became evident. In another minute, respiration was completely reestablished.

The bronchoscopy was then completed and the patient made an uneventful recovery.

CASE 3.—*Asphyxia Neonatorum.*—The mother was suffering from cardiac insufficiency. She gave a history of collapse in a previous delivery.

Anesthesia was administered, consisting of gas oxygen ether. From 2½ to 3 ounces (73.93 to 88.72 cc.) of total ether were given over a period of ten minutes.

The mother's circulation was flooded with oxygen before delivery and while the cord was pulsating.

The baby was delivered by low forceps; it was apparently in good condition, but did not breathe. The cord was pulsating. Moderate cyanosis was present. The throat was sucked out with the little sucker. There was but one effort at respiration on the application of ether to the chest. The body was flexed, suspended by the heels and spanked, but no further respiratory effort occurred. The infant was wrapped up and laid in a crib; it was then transferred to another room across the hall. I left the mother and found the baby absolutely relaxed. There was no respiratory effort whatever. A slight cardiac impulse was visible on the wall of the chest. I exposed the pharynx and larynx; no laryngeal reflex was present. A tube was inserted and a little oxygen and carbon dioxide (10 per cent) administered. The intratracheal tube was removed temporarily. The cords remained separated. The tube was reinserted and intermittent insufflation was continued with the manometer at 10 inches of water. The infant's color improved gradually in from three to five minutes. Suddenly, at the end of an insufflation in which full pressure was used, the baby began to breathe in a rapid and shallow manner. The oxygen pressure having fallen, it was seen that the baby was making an inspiratory effort of about 3 to 4 inches of water, or from 6 to 8 mm. of mercury, when the vent on the intratracheal tube was closed with the thumb.

The breathing through the intratracheal tube could be heard distinctly. The laryngeal reflexes then returned. The cords closed about the tube. Movements of the muscles of the pharynx and the face began to occur. The color was completely cleared; the mucous membrane of the lips became a bright pink. The baby was then given oxygen and carbon dioxide pharyngeally. As the improved condition was retained and the respiratory rate became normal, the oxygen was gradually decreased, and finally withdrawn.

On first exposure, no laryngeal reflexes were visible.

The color gradually improved with insufflation in the absence of respiratory effort.

The respiration was resumed as a very shallow and rapid effort which increased gradually in intensity.

During the beginning of the resumption of breathing, inspiratory effort was found to be about 6 mm. of mercury.

As respiration picked up, laryngeal and pharyngeal reflexes returned.

The intratracheal insufflation tube afforded an absolutely free airway through which the baby could breathe with minimal respiratory effort.

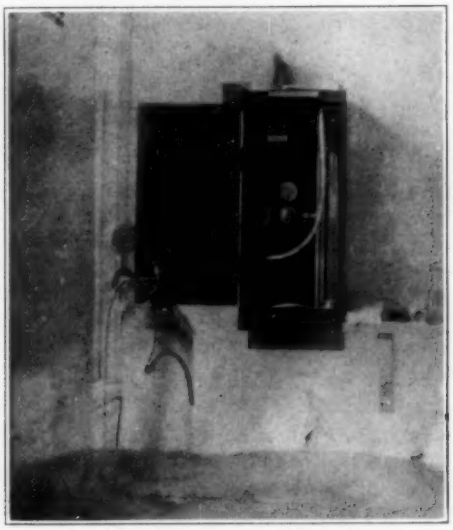

Fig. 1.—Flagg resuscitation equipment for obstetric operating room: abundant suction gas supply and fixed location.

COMMENT

Dr. E. M. Hawkes who has encouraged and supported the method developed by me wrote as follows:

> We have now had considerable experience with your apparatus for resuscitation. We have felt that it is correct in theory, and have found it very practical. It has made the effort at resuscitation exact and satisfactory. We depend on it in all doubtful cases, and we think several babies have been saved. It certainly is a source of comfort.

It is clear that oxygenation of the patient by the insufflation of oxygen depends on the proper functioning of the circulation. When the heart has ceased to beat, the administration of oxygen and carbon dioxide is entirely ineffective. It therefore becomes essential in all

cases of resuscitation to support and stimulate the circulation by heat applied to the body, and by the special cardiac stimulants, caffeine, camphor, strychnine and epinephrine, using extreme caution in the newborn not to overstimulate and ultimately exhaust the heart.

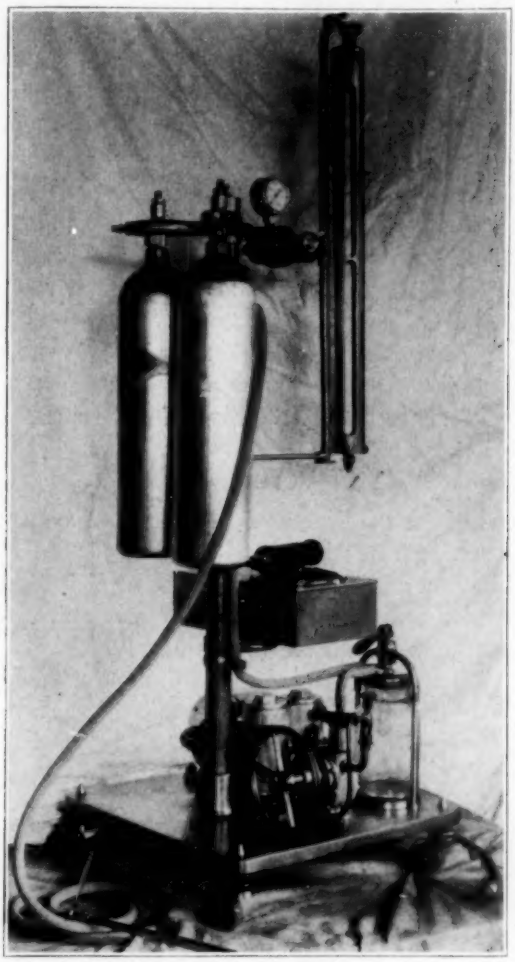

Fig. 2.—Flagg resuscitation equipment for general surgical use.

An equipment for use in the obstetric operating room embodies a water suction system and large cylinders for oxygen carbon dioxide (fig. 1)

A portable operating room outfit with Connell suction attached is shown in figure 2.

DIFFICULTIES OF THE METHOD

The complexity of the apparatus is about that of an ordinary gas oxygen machine manipulated by the average anesthetic technician.

The theory and technic of laryngoscopy in the anesthetized and the asphyxiated patient may readily be acquired by any physician. During the last year, I have given intensive courses in laryngoscopy, in which the subject was covered in a single afternoon period of five hours.

Laryngeal trauma from intubation has not occurred and need not be anticipated when direct vision and ordinary care are employed. The method should be restricted to the use of trained physicians or dentists.

ADVANTAGES

The procedure described is a simple, practical method of exposing the infant and adult larynx in the unconscious and relaxed patient by means of a pocket flashlight laryngoscope.

Suction may be applied to fluid that is visible in the pharynx.

Intubation under direct vision permits nontraumatic intratracheal suction and also intratracheal insufflation of oxygen and carbon dioxide under measured pressure.

SUMMARY

The laity and the medical profession should be trained to meet emergencies requiring resuscitation.

The laity has been and is being trained most efficiently and effectively by the police and the fire departments, gas companies, the Red Cross, etc., in the best method available for its use; viz., the Schaeffer prone pressure method, with and without the inhalation of oxygen and carbon dioxide.

In the extremes of these emergencies the medical treatment has not been in keeping with the progress of medical knowledge and technic.

The first principle of surgical procedure is exposure of the field of operation; the second is the removal of foreign material, solid or fluid from this field, and the third is the application of the treatment indicated, where it is required, namely, in the tracheobronchial tree.

The surgeon exposes an appendix, removes pus or the appendix when it is diseased (has become a foreign body) and applies treatment to the field, such as invagination of the stump and drainage. The patient to be resuscitated should have the upper airway exposed. Foreign matter, such as water, blood, amniotic fluid and vomitus, should be removed. Treatment in this prepared field consists of intubation and intratracheal insufflation of oxygen and carbon dioxide.

Apparatus has been constructed, and is here illustrated, to enable the obstetrician, general surgeon, specialist, physician or dentist to treat asphyxiated patients in a clean, surgical manner worthy of his calling.

1819 Broadway.

SUCTION TONSILLECTOMY*

J. B. H. WARING, M.D.
CINCINNATI

Tonsillectomy is by far the most common surgical operation. I shall not, however, attempt to describe the various modern methods of dealing with pathologic tonsils. From a standpoint of efficiency and the comfort of the patient, I prefer surgical enucleation at one operation to electrocoagulation or electrodesiccation, which may require repeated treatments over a period of weeks.

Perfect enucleation of the tonsils is difficult in many instances, despite the somewhat general idea of the laity that this is a very minor operation capable of performance by almost any physician. Perhaps this erroneous impression has been handed down from the old tonsillotomy days, and it is difficult to educate the public to the correct point of view. Unfortunately, many physicians have the same erroneous impression. The operation should be regarded in its true light as a major surgical operation to be performed best only in a well equipped hospital or clinic, and only by operators trained and experienced in this special surgical procedure. Not only is it sometimes very difficult to perform properly, but in unskilled hands it may be dangerous to life as a result of hemorrhage or some other complication.

Snare and dissection technic, with its various modifications, has held front rank for the past decade or two and is the technic employed by the majority of operators. It is applicable to any and to all types of tonsils, whether local or general anesthesia is employed, and in the hands of the expert operator is in general satisfactory. For certain types of submerged and adherent tonsils it sometimes gives much difficulty and dissatisfaction to the operator, especially if the operation is done under a local anesthetic.

In 1909, the late Greenfield Sluder of St. Louis brought out his technic, with its in-capsule removal of the faucial tonsil. Sluder modified the old MacKenzie guillotine and developed an original technic for its use. His operation impressed on the medical profession the desirability of complete removal of the tonsil when operation was indicated. When performed on the large, hypertrophied tonsils of children, Sluder's operation was comparatively easy; but on the small, deeply submerged and greatly adherent tonsils, so often present with chronic tonsil infection, it was often difficult, if not actually impossible, to use satisfactorily. Likewise, the Sluder operation was not quite so satisfactory with local

* Submitted for publication, April 10, 1930.

anesthesia. Many operators have returned to the use of some form of snare and dissection technic, especially in the cases in which local anesthesia is used, and for all submerged and adherent tonsils, as experience demonstrated that the Sluder technic was not so satisfactory.

Suction tonsillectomy originated from an effort to develop a technic equally applicable to all types of tonsils and whether local or general anesthesia is used. When first presented in 1922, about the only thing worth while in its presentation was its basic idea. Some of the early suction tonsillectomies were crude, as could be expected with crude equipment and undeveloped technic.

About ten years ago, when physicians used the Hurd glass tonsil tube attached by flexible rubber tubing to an electrically driven suction pump, it was noticed in suction cleansure of the tonsils that in certain instances the tonsils seemed to be lifted completely from their fossae into the bowl of the suction tube. The idea occurred that if a snare loop adjusted over the shaft of the tonsil tube could be dropped over the end of the tube in back of the tonsil and then slowly tightened down with the ratchet, the tonsil might be removed easily and rapidly in its capsule, practically without bleeding. This was found possible and practicable, but it was soon seen that the Hurd tube would not do for this operative purpose. In about half of the attempts, the snare loop hung on the lip of the flaring mouth of the tonsil tube. When the snare loop was tightened, the loop slipped down onto the shaft of the tonsil tube instead of off the tube and in back of the tonsil.

After study of the mechanics involved, the present operative type of tonsil suction tube was developed and brought to perfection. Attention was next given to improvement of the suction pump, as air pump efficiency was necessary for perfection of the technic. Today a perfected air pump hook-up, an operative tonsil suction tube and a technic that is satisfactory on all types of tonsils are available to the medical profession. The operation is of great advantage on small, greatly adherent and submerged tonsils.

APPARATUS AND TECHNIC

In place of dissection or the instrumental manipulations of the Sluder technic, in suction tonsillectomy one employs the principle of suction derived from an electrically driven compressed air and suction pump. Suction is applied through a tonsil suction tube of special design, which lifts the tonsil from its fossa and out between the pillars; it holds the tonsil thus in a semi-inverted position in the mouth of the tonsil tube until a dull wire cold snare, previously adjusted in position over the shaft of the tonsil tube, is carried over the end of the tonsil tube and the snare loop is tightened. This causes it to slip off the end of the tonsil tube automatically, and as the snare loop is tightened down still further with the ratchet, the tonsil is enucleated, virtually "shelled-out" in a rapid, clean, in-capsule, practically bloodless manner.

The equipment is comparatively simple, and the technic itself so simple that any operator of average intelligence and operative skill can do good work with it.

While almost any type of air pump may be used, it is important that sufficient suction is developed to stretch the dense adhesions and to lift the submerged tonsils from their fossae properly. The air pump should be controlled with a foot-switch with proper gages and regulatory devices; likewise, it should be protected by a reservoir bottle placed in the suction circuit in front of the suction intake proper so that no saliva or blood is drawn into the pump itself.

The air pump here illustrated has been developed especially in connection with this work, and it operates with efficiency and with satisfaction. It is described in detail in the *Laryngoscope*.[1]

While almost any type of tonsil snare may be employed, I find a ratchet type of snare best. This type of snare seems to be variously described as the Pierce-Mueller, the Beck-Pierce and the Beck-Schenck.

The tonsil suction tubes are made of a special oven-annealed glass, with rubber covered shafts and with bulbous heads uncovered, and are manufactured in three sizes.

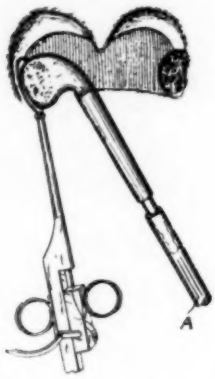

Fig. 1.—This illustration shows the right tonsil lifted from its fossa and engaged in the bowl of the suction tube. The snare loop has been carried down the shaft of the tube, over its bulbous head and in position for enucleation. The suction pump is not shown. *A* shows the end of the flexible rubber tubing engaging the end of the suction tube; the distal portion of the rubber tube connects with the suction pump.

The tonsil tube is connected to the suction intake of the air pump reservoir bottle by about 4 feet of flexible rubber tubing one-fourth inch in diameter. For aspiration of saliva, a second suction line is developed from this duplex pump entirely independent of the main operative line. At operation, these rubber tubing suction lines are suspended conveniently from an overhead cable. In operations performed under general anesthesia, the secondary suction line is tipped with a Yankauer or other suitable aspirating tip and suspended alongside the head of the operating table, so that suction cleansure of the throat may be effected instantly when indicated. The operative suction line is also suspended from the same overhead cable alongside the operating table and about a foot back of the aspirating line. Ether is the general anesthetic of choice, delivered from an anesthesia arm clamped to the end of the operating table. This delivers drop method ether on to a

1. Waring: Operative Air Pump Hook-Up, Laryngoscope **40**:63 (Jan.) 1930.

modification of the Yankauer chloroform mask; but when desired, ether vapor may be delivered from the pressure side of the air pump and carried by a rubber tubing and suitable ether-hook or other tip to the patient's mouth or nose. Because of the rapidity of the operation, some operators employ gas-oxygen, but it does not seem to me that this is desirable. For an operation under general anesthesia, the patient is placed in the supine position, and a Jennings or Denhardt type of mouth gag is employed.

For an operation under local anesthesia, the patient is seated in a semiupright position. While very helpful in operations under general anesthesia, suction cleansure of the pharynx is rarely required when local anesthesia is used. The technic for this procedure is more fully described in the *Eye, Ear, Nose and Throat Monthly.*[2]

With the patient seated in an upright position, the tongue depressor is held in the left hand; light is reflected into the throat from an electric or reflecting type

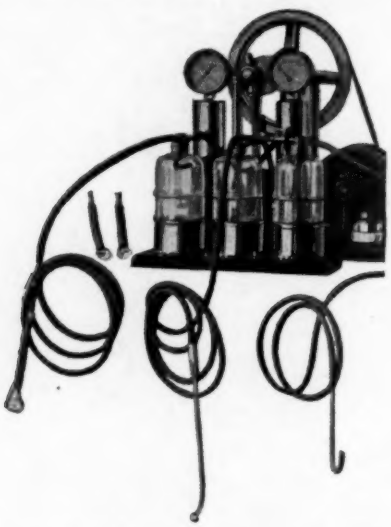

Fig. 2.—Operative pump hook-up; in actual use the suction lines of the rubber tubing are suspended in front of the pump from the overhead cable (not shown in the illustration). The suction line from the reservoir bottle on the right is derived from the air intake of the pressure pump, and serves to actuate the saliva ejector. The suction line from the middle reservoir bottle is from the suction pump proper, and is the main operative suction line. The line of tubing from the bottle on the left is to convey ether vapor from the ether bottle via compressed air from the pressure pump on the left. The ether vapor is delivered to the patient by the ether vapor hook, shown at the lower right side, or from other suitable ether vapor delivery apparatus.

of head mirror, and the tonsil tube-snare assembly is held in the right hand, the snare loop being supsended from the shaft of the tonsil tube and outside the patient's mouth. That size of the tonsil tube is employed which observation indicates will most nearly approximate the size of the given tonsil, and the snare loop is pre-

2. Waring: A Plea for Local Anesthesia Tonsillectomy, Eye, Ear, Nose & Throat Monthly **9**:15 (Feb.) 1930.

viously shaped and adjusted so that it will easily slide over the bulbous head of the tonsil tube.

Under direct inspection in a clear, bloodless field, the tonsil tube is carried into the mouth and gently carried into position over the tonsil, with a dipping, somewhat cuplike motion from below, forward and upward. It is applied very much as the Sluder instrument is applied, but without any appreciable pressure. Usually the right tonsil is removed first. The bulbous head of the tonsil tube is carried in front of the posterior pillar and back of the anterior pillar. If, however, the tonsil is greatly adherent and submerged, the tube mouth is gently pressed over the tonsil between the pillars, which are thereby spread apart. Suction is applied by foot-switch pressure, and almost immediately it is seen through the clear glass of the tube bowl that the tonsil is being lifted from its fossa into the mouth of the tonsil tube. At the same time, gross masses of pus and crypt exudate may often be seen oozing from the tonsil crypts and by suction being carried from the throat through the rubber tubing to the suction reservoir bottle. Ordinarily, the tonsil is lifted out so rapidly that this seems to occur almost instantaneously; but with dense adhesions present, these stretch slowly, and the tonsil engages slowly, that is, by comparison with the nonadherent tonsil. Occasionally, matters may be facilitated by

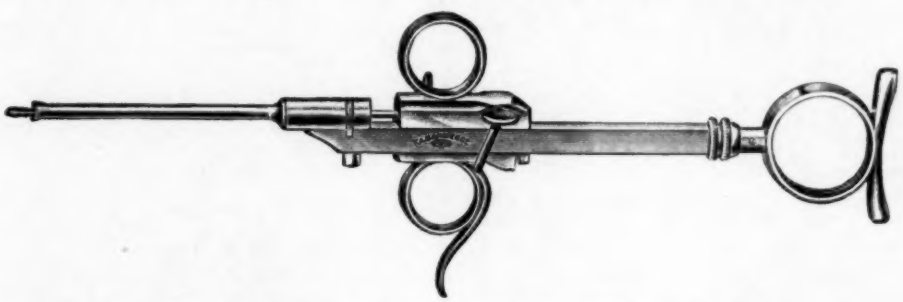

Fig. 3.—Pierce-Mueller ratchet type of snare found best adapted to the technic. The size and shape of the snare loop is adjusted each time so that the loop will easily slip over the bulbous head of the suction tube.

massaging the unengaged portion of the tonsil into the tube bowl with the index finger of the unengaged hand over the anterior pillar, precisely as with the Sluder technic. Completeness of tonsil engagement may also be verified by carrying the index finger over the anterior pillar from above below. If either pillar is picked up through unskilled application of the tube, suction grasp of the tonsil is released by slipping the end of the rubber tube from the tip of the tonsil tube. This is then reconnected and the tonsil engaged properly. Enucleation proper is not proceeded with until observation and, if necessary, digital examination show that the tonsil is properly engaged. The tonsil may be engaged and released several times in succession without any damage, if this should be indicated. Suction grasp of the tonsil does not tear or shred it. If snare play is resorted to before the tonsil is fully engaged, it is possible to slice the tonsil, a mishap which occurs at times with the Sluder technic. Should this happen, the tonsil stump is lifted anew and enucleated with the usual technic; but if reasonable care is used, this mishap will not often occur.

With the tonsil out of its fossa and engaged in the tube bowl, the tube is steadied in position by the right hand, while the pendant snare is grasped with the

left hand and its loop quickly carried down the shaft of the tonsil tube and over its bulbous head; the loop is then tightened by direct pull on the snare trigger. Suction is practically continuous during this maneuver. Next the ratchet trigger of the snare is thrown back with the little finger of the left hand. The grasp of the right hand on the tonsil tube is then shifted slightly so that the tonsil tube and the snare shaft are held in a practically parallel position. The left hand is employed to manipulate the ratchet ring of the snare; this slowly draws the snare loop back into its cannula, the tonsil being inverted and "shelled out" by the loop smoothly and rapidly. There is no dissection at any stage, and no undue pressure or manipulation is employed with the tonsil tube. Suction is continuous; otherwise, as the tonsil is completely freed it would in some instances roll free in the pharynx and perhaps be swallowed or require seizure with grasping forceps to avoid this mishap. With continuous suction, the enucleated tonsil is kept firmly engaged in the bowl of the tonsil tube, which thereby serves as an efficient grasping forceps. The snare and tonsil tube, still grasped in the right hand, are withdrawn from the

Fig. 4.—Simplex anesthesia arm clamped to the end of the operating table, ready for use. The Yankauer-Waring anesthetic cone is shown in the lower right side; a modification of the Yankauer chloroform mask is adapted to drop method ether.

mouth together; suction is discontinued, and the tonsil is removed from the tonsil tube for examination as to perfection of enucleation.

Meanwhile, the patient is told not to clear the throat or to attempt to expectorate, but to lean forward with the mouth slightly open so that any saliva or blood will drool into a pus basin by the force of gravity. Rarely is there any free bleeding; usually a little blood-tinged saliva will drool into the pus basin for half a minute or so; then on inspection the tonsil fossa will be found practically dry. If an oozing point is noted, compression with a suitable tonsil hemostatic forceps takes care of this. Whether local or general anesthesia is used, the fossae should be carefully examined for perfection of enucleation, and to determine that they are perfectly dry before the patient leaves the operating room. The tonsil is carefully examined, and if its capsule is intact, one may be reasonably certain that the enucleation is perfect. If there is a break in the tonsil capsule, the fossa should be carefully examined for a possible shred of tonsil tissue torn off in the enucleation and remaining in situ. Special attention must be directed to the lower portion of the

tonsil fossa and the base of the tongue; if any lingual lymphoid tissue is present and has not been removed by the enucleation proper, it should be removed with snare or scissors. As a rule, however, with correct application of the tube the enucleation is complete.

The left tonsil is removed by the same technic.

For operations performed under general anesthesia, suction cleansure of the throat is employed if necessary. When the right tonsil is removed, a tampon is placed in the empty fossa, and the left tonsil is enucleated. Both fossae are carefully examined for perfection of enucleation, and to see that there is no bleeding. If postoperative inspection is satisfactory, the patient is returned to bed in the on side face, somewhat downward position.

In suction tonsillectomy, the snare loop performs the entire dissection almost automatically. No. 8 snare wire is employed as a routine; but on older patients with a history of repeated attacks of quinsy, or when dense adhesions appear likely a heavier no. 9 snare wire is advisable. Occasionally these adhesions are so dense and leathery that the no. 8 snare loop will be broken. When this mishap occurs, the broken snare loop is disengaged, and the operation is recommenced with a fresh snare.

SUMMARY

Briefly summarized, the advantages of suction tonsillectomy are as follows:

The technic is simple and easily mastered.

It is applicable to all types of tonsils, and can be performed under local or general anesthesia.

The operation is rapid. This means that one can perform a tonsillectomy under local anesthesia on practically all adult patients, even on those who are debilitated and comparatively aged, whereas general anesthesia would add a considerable element of risk. Because of this rapidity, the patient to whom general anesthesia is given requires only a light and comparatively brief period of anesthesia. The brief period of anesthesia aids in recovery from the anesthetic, and is easier on body functions as a whole than a more prolonged period.

Suction tonsillectomy is a practically bloodless operation in most cases. This does not mean that bleeding will never be encountered. Primary hemorrhage is not often met with, and secondary hemorrhage is comparatively still more infrequent. Free bleeding tends to frighten the patient when a local anesthetic is used. He is told that with the suction technic there may be a little blood-tinged saliva or possibly a little free blood from one or both tonsils. When he knows what to anticipate, he feels little apprehension or fright.

It is an in-capsule enucleation, and in this regard compares favorably with the Sluder technic, so that today many operators who formerly used the Sluder technic employ suction technic entirely.

This method removes easily, cleanly and rapidly in-capsule practically all types of tonsils and the stumps of tonsils left from former tonsillectomies.

There is no injury to the pillars, uvula or underlying structures of the throat; these are not torn, cut, bruised or lacerated. Apparently there is not a great deal of postoperative pain in the average case, and the period of convalescence seems to be considerably shortened.

Postoperative abscess of the lungs must be of comparatively rare occurrence with this technic; at least, no record of this complication has been located. When the suction tube is applied to a tonsil in the course of enucleation, an often astonishing amount of pus and gross amounts of crypt exudate are vacuum-cleaned from the tonsil and rapidly carried by suction into the reservoir bottle. Through the clear glass of the suction tube bulb this process may be easily observed in a great many instances. In dissection and with the Sluder technic, this material is usually squeezed out of the tonsil crypts during instrumentation, and if aspirated into the lower air passages, as seems to occur in many instances, may eventuate in pulmonary abscess. So strongly has this potential danger been impressed on me, that I would urge that every tonsil be thus vacuum-cleaned prior to enucleation. This is an integral step in every suction tonsillectomy; it takes only a few seconds for routine performance, and does not interfere with the following application of whatever technic the operator prefers.

Effort has been made to describe suction tonsillectomy without undue emphasis on its several features as compared with other methods of tonsil enucleation. It should be carefully observed on a series of so-called "difficult" cases for proper evaluation. For best results on all types of tonsils, proper equipment and technic are essential.

THE TREATMENT OF AN EARLY MALIGNANT CONDITION OF THE LARYNX BY ELECTRODESICCATION AND RADIUM *

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I shall tell briefly my experience in the treatment of patients with early malignant growths of the larynx by electrodesiccation and radium. I do not wish to claim priority in this work, for I know that many members of the medical profession have been working along similar lines as long as I have, or perhaps longer.

I became interested in the pioneer work of Dr. William L. Clark, of Philadelphia, in electrodesiccation, and I determined to apply his methods in my own field. For the past fifteen years, I have found electrodesiccation an invaluable aid in destroying malignant growths of the lips, mouth, tongue, pharynx and larynx. Radium I use almost entirely as a postoperative measure for, as is known, it has a selective softening influence on scar tissue. Preparatory to the destruction of the growth the patient is given deep roentgen-ray therapy.

I am well aware that in England and elsewhere, particularly at St. Bartholomew's Hospital in London, a few excellent results have been obtained by the application of small doses of radium over a comparatively long period of time, following the resection of a window of cartilage from the wings of the thyroid. With this method I have had no personal experience, but I am interested in the final outcome. Since submitting this paper I have had the opportunity of learning the results obtained by Mr. Harmer[1] of St. Bartholomew's. In a series of fifteen selected cases there were eight in which only one vocal cord was involved. Six of these cases were free from recurrence after a period of from one to three years; both the voices and the vocal cords were normal. In five cases in which both vocal cords were involved, one patient remained cured for four years, while the others died. Two patients with extrinsic cancer died.

A. E. Hayward Pinch,[2] of the Radium Institute in London, advises a surgical procedure in preference to radium in early cases of carcinoma

* Submitted for publication, Feb. 7, 1930.
* Read by invitation before the American Laryngological, Rhinological and Otological Society at Manhattan Eye, Ear, Nose and Throat Hospital, Jan. 4, 1930.

1. Harmer: Brit. M. J. **2**:886 (Nov. 17) 1928.

2. Pinch, A. E. Hayward: A Clinical Index of Radium Therapy, London, The Radium Institute, 1925, p. 130.

of the larynx, and he suggests the use of radium only as a palliative measure in late cases and for patients who refuse operation. My results before adopting electrodesiccation for the destruction of malignant laryngeal growths were disappointing. When the growth is limited to the vocal cord, as shown in the accompanying illustration (*A*), it can be completely destroyed by electrodesiccation through the laryngeal speculum. When the ventricle and the false vocal cords are involved (*B*), it is necessary to split the larynx open in order to obtain a complete and satisfactory exposure of the growth. When the growth has encroached on the arytenoid cartilage and the posterior third of the larynx (*C*), laryngectomy is the operation of choice. Extrinsic cancer with glandular involvement is almost invariably fatal, and the necessity for early diagnosis cannot be too strongly stressed.

The following reports may prove of interest.

A, the growth is limited to the vocal cord; it can be destroyed by electrodesiccation through the laryngeal speculum by the direct method; *B*, a fringelike growth involving the true vocal cord and encroaching on the laryngeal ventricle; laryngofissure is indicated, in order to obtain a complete and satisfactory exposure of the growth; *C*, a growth involving the posterior half of the larynx, including the true vocal cord, ventricular band and aryepiglottidean fold; laryngectomy is the operation of choice.

REPORT OF CASES

CASE 1.—A man, aged 52, referred to me by Dr. T. Passmore Berens, of New York, had huskiness of the voice of two months' duration. Examination revealed a diffuse infiltrating growth involving the left vocal cord and encroaching on the ventricle of the larynx and the left vocal process. The Wassermann reaction was negative. Antisyphilitic treatment was given for six weeks before it was definitely decided to operate. A few days before operation the patient conferred with Dr. Berens and a leading laryngologist in Montreal, who confirmed my opinion as to the absolute necessity for operation. Under chloroform anesthesia, a high tracheotomy was performed and the larynx was split open. The growth was found as described and was removed by the high frequency current. Biopsy showed the growth to be a squamous cell epithelioma. The tracheotomy tube was not removed for a week following operation. Convalescence was delayed in this case, owing to sloughing of the left wing of the thyroid.

It is now over eight years since the operation, and there is no sign of recurrence. The patient has lately written to me that he has never enjoyed better

health. His voice is husky, but he can be heard easily on the long distance telephone, and he has no difficulty in attending to the multifarious duties incident to his position as manager of a large corporation.

CASE 2.—A man, aged 60, consulted me in November, 1925, regarding huskiness of the voice following an attack of influenza two months previously. Examination revealed an uneven, fringelike growth involving the anterior two thirds of the left vocal cord and slightly ulcerated in its center. A Wassermann reaction was negative, but the patient was given the therapeutic test as a routine procedure. Four weeks later, the appearance of the growth showed no improvement. I conferred with Dr. Birkett, who agreed with me as to its nature. Under general anesthesia I desiccated the growth by the direct method. Three weeks later, when the reaction had subsided, the patient was given gamma radiation externally, followed two weeks later by intralaryngeal radiation with the Yankauer tube. Two more radiations were given. In all, he had 2,500 mg. hours of radiation.

This patient had prolonged periods of nausea, vomiting and general malaise following each radiation. In order to build up his general health and morale he was given a course of ultraviolet ray treatments. The benefit he derived from these treatments far exceeded my expectations. As a result I have prescribed the use of the Alpine lamp for all my malignant cases. I am supported in this by no less an authority than Mr. Handley,[3] of London, who, in a recent paper in the *British Medical Journal* on lymphatic stasis as a causation of cancer, stated that every patient suffering from cancer who came under his care was given Alpine lamp therapy, and that they all derived marked benefit from it.

At present, more than four years after operation, the patient is enjoying excellent health, his voice is normal and his larynx presents a normal appearance.

Although the growth was not malignant, I should like to include a case that illustrates effectively the value of the high frequency current in the treatment for laryngeal papilloma.

CASE 3.—A school teacher, aged 30, consulted me in 1926 for a huskiness of the voice from which she had suffered for three years. She had been treated at a large English hospital for two years, during which period she had been operated on several times for the removal of papilloma of the larynx. She had also received four or five applications of radium. In spite of this, there had been rapid recurrence of the growths following each removal.

Examination of her larynx showed multiple papillomas causing almost complete occlusion of the anterior two thirds of the glottis and a large subglottic pediculated mass which moved upward and downward during respiration. Under chloroform anesthesia, the papillomas were removed with forceps and the bases desiccated with the high frequency current. Five weeks later, the larynx presented a normal appearance; the patient's voice was clear and strong, and she was able to resume teaching. There has been no recurrence for the past three years.

In striking contrast, I mention one of my first cases, observed in 1903.

CASE 4.—A child, aged 3 years, had multiple papillomas of the larynx. Her breathing was greatly obstructed, and immediate tracheotomy was necessary.

3. Handley: Brit. M. J. **2**:607 (Oct. 5) 1929.

She had received palliative treatment without benefit. I did a laryngofissure and removed the growths, which soon recurred. I think I may say a cure was effected, though I had to leave a tracheotomy tube in place for over three years, changing it from time to time to prevent ulceration of the trachea. It was a tedious procedure, but when the patient was last seen, while there was some narrowing of the trachea, there was no interference with respiration, as shown by the fact that the patient is a good tennis player and her voice is normal.

I have selected these few cases from the many that have come under my care and observation. Since I adopted the use of electrodesiccation, the results have been satisfactory in every case that I have seen early.

SUMMARY

In summing up the advantages of this method of treatment, the following considerations seem to me of paramount importance: Given an apparent case of cancer, I do not think that the surgeon is justified, either before or after the therapeutic test for syphilis, in removing a section for microscopic examination. This procedure sometimes results in metastases, and in any case the growth has to be dealt with. The satisfaction of an absolute diagnosis, is, in my opinion, not worth the risk to the patient if syphilis and tuberculosis have been excluded. (It goes without saying that a most careful history must be taken.) I am not alone in this opinion, for I have conferred with many eminent surgeons and pathologists who hold the same view.

By excising the growth well into healthy tissue, using the high frequency current, the blood and lymphatic channels are sealed, and hemorrhage and metastases prevented. The main point to be emphasized is the complete removal of all diseased tissue. Comparatively little pain follows electrodesiccation, and rapid healing of the tissues take place.

This current is under perfect control and can be used to stimulate, sterilize and destroy. I use the monopolar current in laryngeal cases and in superficial growths. When greater destruction of tissue is required, the bipolar current should be employed. The amount of current used depends on the work to be done. To obtain the best results, judgment, experience and a thorough knowledge of the machine used are imperative.

I invariably use chloroform anesthesia, as I am unwilling to risk a possible explosion by administering ether. I have had no experience with rectal anesthesia, but local anesthesia has, in my hands at least, proved unsatisfactory.

Cooperation between surgeon, radiologist and internist is essential in the best interest of the patient.

An optimistic attitude, sunlight, the Alpine lamp treatment, fresh air and a happy environment are incalculable aids in the treatment for laryngeal carcinoma, indeed, for all carcinomas. A laryngectomy can be done, of course, but who would wish to go through life with the trachea stitched to the skin if it can possibly be avoided?

In all late cases, it is useless to waste time with palliative measures. Laryngectomy should be done at once if the patient's condition warrants it.

PRIMARY CHOLESTEATOMA OF THE SINUSES AND ORBIT

REPORT OF A CASE OF MANY YEARS' DURATION FOLLOWED BY CARCINOMA AND DEATH *

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The title of this paper naturally eliminates from discussion secondary cholesteatoma of the sinuses. Secondary cholesteatoma of the middle ear and mastoid, which is seen rather frequently, is likewise not under discussion in this paper.

REPORT OF CASE

History.—Mr. A., aged 40, single, a farmer, first presented himself for examination on Feb. 9, 1916. The history was related by the father, because the patient's mentality was substandard. His sister volunteered the information that he had always been peculiar, and that for a few years previously he had been insane.

He was struck in the right eye with a piece of steel at the age of 20. Since that time this eye had been gradually assuming more and more prominence. He did not believe that the steel entered either the eyeball or the orbit. This history of injury is of doubtful value. At times the eyeball almost protruded between the lids so that the lids rested behind the globe.

Examination.—Examination revealed vision 2.5 per cent in the right eye and 75 per cent in the left. The vision of the better eye could be made normal, or 100 per cent, with correcting lenses, but that of the poorer eye could not be improved.

Examination of the anterior segment of each eye gave negative results except for the exophthalmic appearance of the right eye. The left fundus was normal, but the right optic disk showed marked atrophy. There was an absence of organized exudate about the disk to indicate a neuroretinitis, papillitis or choked disk preceding the atrophy, so that the optic atrophy could most likely be attributed to the stretching of the nerve from the extreme exophthalmos and the pressure on the nerve by the cholesteatoma. There were a few floaters in the right vitreous.

The ears were normal. All of the turbinates on the right were red and swollen. There was thin, foul-smelling seropus in the middle meatus on the right. The tonsils were small, flat, submerged and fibroid. There was dry mucopus in the nasopharynx. The larynx was normal. The teeth were poorly kept and the gums had receded. The left side of the nose was normal.

Transillumination gave negative results on the left, but the right frontal and right maxillary were dark. The roentgen examination showed cloudy right frontal, ethmoidal and maxillary sinuses. All of the other sinuses were clear.

The general physical examination gave negative results.

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A diagnosis was made of probable benign tumor originating in the anterior group of sinuses with invasion of the right orbit. The history of slow growth over a period of twenty years probably excluded malignancy. An exploratory operation was advised and refused.

I did not see this patient again professionally until June 30, 1919, when he returned complaining of more exophthalmos, poorer vision and more pain.

Second Examination.—Examination revealed more exophthalmos and vision of 1 per cent in the right eye. There was more edema of the upper lid of the right eye and more conjunctivitis. There was keratitis due to exposure at the lower corneal margin. The eyeball was lower than before from a tumor mass under the right orbital rim above, which was pushing the globe down.

The results of the general physical examination and the Wassermann test of the blood were negative. Examination of the fundi, ears, nose and throat showed about the same condition as three years before. The roentgen examination showed more dense shadows of the right orbit and right anterior group of sinuses. Transillumination was the same as before.

Operation.—On July 14, 1919, an exploratory operation was performed on the right orbit by a modified Krönlein method. As the incision was completed, a milky fluid came out which had a foul odor. When the wound was opened, a cholesteatoma approximately 7 by 5 cm. in size was removed from the right orbit and right frontal sinus, as the floor of the latter was absent.

Following the operation there was much less exophthalmos, although the vision of the right eye remained at 1 per cent during the subsequent three months. Efforts to get the patient to submit to a radical operation on the frontal and maxillary sinus in order to remove completely all of the cholesteatoma and prevent recurrences in the orbit were of no avail. His subnormal mentality could not comprehend the dangers of pressure necrosis from the cholesteatoma.

On Dec. 6, 1927, I was asked to see this patient at the hospital in consultation. He was suffering from paraplegia. The roentgen examination showed exposure of the frontal lobe on the right as a result of the pressure necrosis from the cholesteatoma. A sinus leading from the center of the former incision at the outer orbital rim on the right was discharging a foul-smelling, milky fluid. A probe readily entered the orbit and the frontal sinus. There was more exophthalmos. The other observations were not different from those already enumerated.

A spinal puncture withdrew spinal fluid under pressure higher than normal and greatly relieved the paraplegia. For about one month the patient had an ataxic gait, but he entirely recovered from the paraplegia and ataxia. He steadfastly refused to have anything done to remove the cholesteatoma.

On Sept. 12, 1929, he returned complaining of more exophthalmos of the right eye and more pain. He was then 54 years of age, so that he had been under observation for nearly fourteen years. The vision of the right eye was at this time nil, as he could not even recognize a bright light. Vision of the left eye was 40 per cent. There was a firm tumor mass extending from under the right upper orbital rim which had not been present before. The exophthalmos was so extreme that the upper lid could be kept over the globe only with difficulty, in spite of the enormous size of his lid. The results of the general physical examination and Wassermann test of the blood were again negative. Examination of the ears, nose and throat, including roentgen examination, transillumination, etc., gave results as previously noted. More time was taken to study his condition. He was presented at the October meeting of the Colorado Otolaryngological Society and at the November meeting of the Denver Clinical and Pathological Society.

On Nov. 21, 1929, the right eye was enucleated under ether anesthesia, and the former Krönlein incision reopened. A large cavity in the orbit and frontal sinus was found, but little cholesteatoma. Tissue curetted from these cavities was submitted to Dr. Philip Hillkowitz for microscopic study. His report is as follows:

Microscopic Report.—The gross specimen consisted of several pieces of tissue measuring about 2 by 3 by 0.5 cm. removed from the right orbital region. They were red with areas of gray and were of crumbly consistence.

Microscopic sections revealed masses of epithelial cells of the squamous type growing atypically with the formation of horny pearls. There were numerous mitotic figures.

The pathologic diagnosis was squamous cell carcinoma of the orbit and frontal sinus.

Deep roentgen therapy and radium were used, but without avail. The patient died in January, 1930.

REVIEW OF LITERATURE

A review of the literature of primary cholesteatoma of the sinuses shows that few articles have been written on this subject. The literature of secondary cholesteatoma of the middle ear and mastoid is, on the other hand, voluminous.

About the year 1840, J. Muller [1] described new formations in the temporal bone resembling pearly growths. They were composed of concentric layers of epidermoid cells with cholesterol crystals between them.

Cholesteatomatous or caseous rhinitis was first described by Duploy and Follin [2] in 1874. This rare disease seems to be more the result of some associated condition than a process actually involving the nasal mucosa. In the few cases reported, each shows different etiologic factors. There is an accumulation in the nasal fossa of a cheesy, gelatinous material, often to the extent of actual displacement of structures and of facial deformity. There is associated with it an extremely fetid odor, more foul, if possible, than that occurring in ozena. No special micro-organisms are found except those of decomposition. Microscopically, the material shows fatty cells, granular leukocytes, stearin, and cholesterol crystals. The condition occurs in persons with a tuberculous tendency or in those who possibly have been infected with syphilis. In one case reported, the cause was believed to have been a myxomatous growth which had undergone degeneration.

Heimendinger [3] said that "cholesteatoma formation may be due to independent causes. 1. The disturbance in evolution during embryonic

1. Muller, J.: Ballenger's Text Book of Diseases of the Nose, Throat and Ear, ed. 4, Philadelphia, Lea & Febiger, 1914, p. 761.

2. Duploy and Follin, in Kyle: Text Book of Diseases of the Nose and Throat, ed. 5, Philadelphia, W. B. Saunders Company, 1915, p. 86.

3. Heimendinger: Beiträge zur pathologische Anatomie der Kieferhohle, Arch. f. Laryngol. u. Rhinol. **19**:382, 1907.

life (true cholesteatoma). 2. Encroachment of the epithelium from without into the sinus cavity (false cholesteatoma). The true cholesteatoma exists from birth and is probably a factor in the causation of the subsequent empyema. The false cholesteatoma is always dependent upon, and the product of, the existing sinus suppuration."

Sir St. Clair Thomson [4] had the following to say: "A few cases of this rare condition (cholesteatoma of the accessory sinuses) have been described. It is characterized by an exaggeration of the usual symptoms of suppuration in these cavities, particularly by local pain. The cholesteatomatous masses are very fetid, the bony walls of the sinus are often rough, as if necrosed, and fistulae may follow."

Ross Hall Skillern [5] said:

This may be due to two independent causes. 1. The disturbance in evolution during embryonic life (true cholesteatoma). 2. Encroachment of the epithelium from without into the sinus cavity (false cholesteatoma). The true cholesteatoma exists from birth and is probably a factor in the causation of the subsequent empyema. The false cholesteatoma is always dependent upon, and the product of, the existing sinus suppuration.

Cholesteatoma formation is characterized by the formation of a whitish or grayish mass within the sinus, distinctly lamellated, having an extremely foetid odor and showing the presence of cholesterin crystals. According to their origin they are divided into: (1) primary or true cholesteatoma; (2) secondary or false.

1. The true cholesteatoma is undoubtedly of foetal origin, being due to some disturbance in the normal embryonal growth of the epidermis causing an untoward proliferation into the bones of the sinus, which acts as the nidus for the subsequent formation of the tumor. This is deep-seated and involves underlying bone.

2. The secondary or false cholesteatoma is caused by a metaplasia of the normal cylindrical epithelium of the sinus which takes place either directly from the diseased atrophic nasal mucosa or through a fistulous passage into the mouth. This is superficial and affects only the mucosa.

The squamous epithelium grows through the opening until it meets with the inflamed cilated lining of the sinus. Being unable to unite with it, the epidermis grows in layer form, which soon finds insufficient nourishment and dies, another layer taking its place. In this way we can account for the laminated structure which has very aptly been likened unto the layers of an onion. An external or fistulous opening is necessary in order for this to form.

The subjective disturbances occasioned by these bodies depend upon their size and the pressure exerted upon the sinus walls. When the cholesteatomatous mass fills the antrum, bulging of the walls is noted, accompanied by intense pain. Tenderness is marked over the entire area, with swelling of the lower lid. The naris on the affected side is filled with foetid pus and the inferior turbinate markedly congested.

Operation will disclose a desquamative inflammatory mass of moist caseous lamellated epithelium and putrefying detritus with an extremely foetid odor, which,

4. Thomson, Sir St. Clair: Diseases of the Nose and Throat, ed. 2, New York, D. Appleton & Company, 1916, p. 310.

5. Skillern, Ross Hall: Accessory Sinuses of the Nose, ed. 4, Philadelphia, J. B. Lippincott Company, 1923, pp. 53, 136 and 137.

if a true cholesteatoma, will be intimately adherent to the underlying bone; if secondary, will allow itself to be shelled out en masse. In the embryonal form unless all of the membrane is removed at the time of operation a recurrence will certainly take place.

The secondary form in contradistinction to the former, being caused by the sinusitis, will respond readily to operative treatment.

Otrich [6] reported a case of what seems to have been true or primary cholesteatoma involving the ethmoidal cells and maxillary sinus on the right side. He found that pressure necrosis, produced by the cholesteatoma, had made one large cavity in the ethmoidal labyrinth and maxillary sinus. He emphasized the foul odor and the milky discharge as important symptoms.

Austin A. Hayden, in discussing Otrich's paper, mentioned a case of what he believed was true cholesteatoma involving the frontal sinus. As the cholesteatoma formed following a Killian operation, this suggests a secondary or false cholesteatoma. The patient was seen at the New York Post-Graduate Hospital in the service of Dr. Beman Douglas. These two reports do not mention any involvement of the orbit or eyeball.

Haeggström [7] has reported a case of primary cholesteatoma involving the right frontal sinus and pushing the right eyeball downward with double vision. The vision of the right eye was 50 per cent and that of the left 120 per cent. The vision of the right eye was made normal by a minus lens. The Wassermann reaction was negative.

Haeggström made a horizontal incision on the right at the upper margin of the frontal sinus through which he removed the cholesteatoma. The eyeball resumed its normal position, and double vision ceased following the operation.

CONCLUSION

In conclusion it may be of interest to emphasize the following points: (1) the long duration of the disease in the case I have reported, which was probably thirty-four years; (2) the rarity of primary cholesteatoma; many cases reported as primary are really secondary to a previous operation by the external route, and (3) the final termination in carcinoma followed by death early in January, 1930.

Physicians' Building.

6. Otrich, G. C.: Cholesteatoma Involving the Ethmoidal Cells and the Antrum of Highmore, Illinois M. J. **48**:397, 1925.

7. Haeggström, A. A.: Cholesteatoma Removed from Frontal Sinus, Hygiea **78**:1122 (Aug. 15) 1916.

FUSOSPIROCHETIC OTITIS *

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Fusospirochetosis, as I [1] have demonstrated more than once, is a specific and well defined disease, which may be located in any of the several parts of the body. The ear is no exception; it may lodge in any of its parts, revealing itself there as typically as it does anywhere else. Such cases as have been observed are infrequent and scattered, and as a rule have been superficially studied. For this reason fusospirochetosis of the ear may appear to most otologists as simply a complication of otitis, devoid of any special characteristics.

The accurate studies which I have been carrying out for years on the various localizations of fusospirochetosis and my observation of some cases occurring in the ear, which I have been fortunate enough to see, have convinced me that this otitis presents as distinct a clinical picture as that of Plaut-Vincent's angina, which is the pharyngeal localization of the same disease. For this reason I conclude that the otitis and the angina are not distinct morbid conditions but separate localizations of a specific condition. If textbooks assign special chapters to Plaut-Vincent's angina, to "ulcus tropicum" or to ulceromembranous stomatitis, there is no reason why they should not do the same for fusospirochetic otitis.

In the study of the disease confusion arises between the cases in which the presence of the fusospirochetic symbiosis is simply saprophytic and those in which it is pathogenic. It is unnecessary to remark that the presence of this or that germ here or there in the body does not imply the existence of the disease usually caused by it. What takes

* Submitted for publication, Dec. 10, 1929.

1. Mangabeira-Albernaz, P.: O bismuto na angina de Vincent, J. d. Clin. **3**:355 (Dec. 15) 1922; Tratamento simples e prático da "úlcera tropical," ibid. **4**:129 (May 15) 1923; La thérapeutique de l'angine de Vincent, Arch. internat. de laryngol. otol. rhinol. **3**:917 (Sept.-Oct.) 1924; Considerações em torno do tratamento da "úlcera tropical," Brasil-med. **39**:123 (Sept. 10) 1925; Rémarques sur le traitement étiologique de l'angine de Vincent, Arch. internat. de laryngol. otol. rhinol. **4** (Sept.-Oct.) 1925; Otite fusi-espiroquética, J. d. Clin. **6**:258 (Sept. 30) 1925; L'ulcère phagédénique tropical et son traitement par les insufflations de bismuth, Bull. Soc. path. exot. **19**:115 (Feb.) 1926; Bismuth et fuso-spirochétoses, Ann. dermat. et syph. **8**:34 (Jan.) 1927; As manifestacoes buco-faringeas da fuso-espiroquetose e seu tratamento pelo bismuto, Rev. Brasil Med. e Farm. **3**:201 (May and June) 1927; The Etiology and Etiological Treatment of Plaut-Vincent's Angina, Laryngoscope **39**:1 (Jan.) 1929.

place with regard to the Le Dantec-Vincent germs, for example, in the mouth, where they are saprophytic, may also happen in the tympanic cavity, which they easily reach through the eustachian tube. Popovic,[2] finding the germs of the fusospirochetic symbiosis quite frequently in the pus from sixty-nine patients with otitis media, decided to treat them with arsenic, and obtained negative results. It is clear that here the germs were merely saprophytic, and that their elimination would not effect a cure.

In this study I shall try to avoid the confusion referred to, excluding all cases not clearly proved to be fusospirochetic otitis. I shall, however, list separately the doubtful cases.

REVIEW OF THE LITERATURE

Systematic research on the fusospirochetic symbiosis in the purulent secretion of the ear was first carried out in 1917 by Wyatt-Wingrave,[3] who found the germs in 30 per cent of the cases of chronic otitis. In 1924, Busacca[4] established the presence of the fusiform bacillus and of Vincent's spirochete in chronic suppuration of the tympanic cavity in 25.6 per cent of his cases, and made the following classification: positive preponderance of these two germs over the others present in 12.2 per cent; their presence in moderate amount in 7.3 per cent, and rare in 6 per cent. Two years later, Popovic[2] discovered the symbiosis in twenty-eight (40.5 per cent) of his sixty-nine cases of chronic purulent otitis media; 8 per cent showed a positive preponderance of the symbiosis, 8 per cent a moderate degree of symbiosis, and 12 per cent the presence of the two germs in negligible quantity. From this it follows that a positive predominance of Le Dantec-Vincent germs is seen, at best, in only 12.2 per cent of the cases.

Various authors record isolated cases of this symbiosis in the purulent secretions of the ear. Plaut[5] reported one instance in 1919, supposing that this was an unobserved fact at the time. Kunc[6] referred to two cases of Evers, one of Novak and one of Yates.

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2. Popovic: Les fuso-spirochètes dans les otites suppurées, L'Immunité **2**:8 (July 15) 1927.

3. Wyatt-Wingrave: J. Laryng. & Otol. **32**:403 (Oct.) 1917.

4. Busacca, G.: L'assoziazione fuso-spirochetica nel pus delle otiti, Naples, 1924.

5. Plaut, A.: Ueber fuso-spirillaere Assoziation im Mittelohr, Zentralbl. f. Bakteriol. **83**:537, 1919.

6. Kunc, K.: Sekundaer-und Mischinfektion (Symbiose) und Assoziation fusiforme-spirochaete Bedeutung der Plaut-Vincent Mikroben für Mittelohrentzuendungen, Čas. lék. česk., 1922, vol. 61, in Zentralbl. f. Hals-, Nasen- u. Ohrenh. **2**:212, 1922.

HISTORICAL SKETCH

Gerlach [7] was the first to call attention to the possibility of the fuso-spirochetic symbiosis being the cause of disease in the ear. In 1911, he published the first observation of what he called "ulceromembranous otitis." The case was supposed to be sporadic. It was only in 1917 that Wyatt-Wingrave,[3] noticing the frequency of Le Dantec-Vincent germs in discharges of the ear, pointed out that these micro-organisms probably played a definite rôle in causing chronic otitis. This was the starting point for the study of the problem, which, however, has been fully under way only since 1924. Priority in this work belongs to Gerlach,[7] but it is only fair to point out the contribution of the Italian school, with Calamida,[8] Calicetti [9] and their co-workers in the lead.

GEOGRAPHIC DISTRIBUTION

Fusospirochetosis of the ear has been observed in central Europe, in Russia, in Italy, in England and in South America. There is to date in Brazil a record of three published cases: one by Rohr,[10] in 1922; one by Barros,[11] in 1924, and one by Mangabeira-Albernaz [12] in 1925.

FREQUENCY

The form of fusospirochetosis which is being studied is considered rare. Raspopoff, on reporting his case, declared that it is the twenty-first on record. After examining an extensive bibliography on the subject, I was able to find records of only twenty-five undoubted cases of fusospirochetic lesions of the auditory tract. These were reported by Gerlach [7] in 1911; Mathers [13] in 1917; Cheatle,[14] two in 1920; Ryland [15] in 1921; Frenzel [16] in 1921; Kunc,[5] two in 1922; Mouret and Cajezust [17] in 1922; Rohr [10] in 1922; Calamida [8] in 1923;

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7. Gerlach: Otitis externa ulceromembranacea, Ztschr. f. Ohrenh. **64**:309, 1911.

8. Calamida, U.: L'angina de Plaut-Vincent e primitive localizzazioni fuso-spirochétiche al naso e al'orecchio, Bologna, Cappelli, 1924.

9. Calicetti: Étude bacteriologique des otites moyennes chroniques, Arch. internat. de laryngol. otol. rhinol. **4**:341 (Jan.) 1925.

10. Rohr, C.: Um caso de otite externa fuso-espirilar, Brasil-med. **36**:341 (Nov. 25) 1922.

11. Barros, S.: Otite de etiologia rara: bacilo pseudo-diftérico e simbiose fuso-espirilar, Lab. Clin. **4**:1 (July) 1924.

12. Mangabeira-Albernaz (footnote 1, sixth reference).

13. Mathers, R. P.: Vincent's Disease of the External Ear Occurring in the Course of Chronic Middle Ear Suppuration, J. Laryng. & Otol. **32**:159 (May) 1917.

14. Cheatle, A.: Vincent's Angina of the External Auditory Meatus, J. Laryng. & Otol. **35**:6 (Jan.) 1920.

15. Ryland, W.: J. Laryng. & Otol. **36**:27 (Jan.) 1921.

16. Frenzel: Ein weiterer Fall von Otitis externa ulceromembranacea, Arch. f. Ohren.-, Nasen- u. Kehlkoph. **107**:124, 1921.

17. Mouret and Cajezust: Presse méd. **30**:706, 1922.

Raspopoff [18] in 1924; Barros [11] in 1924; Bernea,[19] three in 1924; Riccitelli and Doria Medina [20] in 1924; Tetu [21] in 1925; Mangabeira-Albernaz [12] in 1925; Matvejev [22] in 1926; Trutnev [23] in 1927; Leto [24] in 1927; Motta,[25] two in 1928, and Leto [26] in 1929. I shall report, in addition to the case that I observed in 1925, four others seen since.

REPORT OF CASES

CASE 1.—V. C., a white boy, aged 7, a Brazilian, was admitted to the oto-rhinolaryngologic clinic of the Santa Casa Hospital on March 21, 1927, with a history of a purulent discharge from both ears ever since he was 1 year old. He was a deaf-mute. Recently he had suffered from earache on the left side.

Examination of the right ear showed suppurative chronic otitis media. The membrane of the drum was red and much inflamed, and an elliptic perforation was seen at the junction of the posterior quadrants. Dark pus of very offensive odor was being discharged. The drum membrane of the left ear was not visible; the external canal was full of pus of an offensive odor. A small superficial ulcer, covered with a very closely adherent membrane, was seen on the lower wall of the external canal; the drum membrane was almost entirely destroyed, and the mucous membrane was positively polypous, with a small fully formed polypus.

The tonsils were small and infected. There was a very high vaulted palate. An intense follicular pharyngitis was present. Microscopic examination revealed the presence of the germs of fusospirochetosis in great numbers, so that they were completely dominant in the microscopic field.

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18. Raspopoff, A.: Die eitrigen Otitiden durch Erreger der Ang. Plaut-Vincent hervorgerufen, J. Uschn. nosov., 1924, vol. 1, in Zentralbl. f. Hals-, Nasen- u. Ohrenh. **4**:460, 1925.

19. Bernea, L.: Les otites ulcereuses à bacilles de Vincent, Rév. de laryngol. **45**:403 (Dec.) 1924.

20. Riccitelli, E., and Doria Medina, V.: A proposito de la observation de una afeccion raramente constatada en otologia: La otitis externa à bacilos de Vincent, Semana méd. **2**:1396 (Dec. 15) 1924.

21. Tetu, I.: Mischinfektion mit Vincent Spirillum bei Erkrankungen des Gehörapparats, Spitalu, 1925, in Zentralbl. f. Hals-, Nasen- u. Ohrenh. **8**:300, 1926.

22. Matvejev, D.: Ein Fall von Ohrmuschelläsion durch den Plaut-Vincent Bacillus in Symbiosis mit der Spirochaete, Vestnik r. l. otiatrii, 1926, in Zentralbl. f. Hals-, Nasen- u. Ohrenh. **10**:815, 1927.

23. Trutnev, N.: Ein Fall von eitriger Mittelohrentzündung kompliziert durch Symbiosis mit der Vincent Spirochaete, Vestnik r. l. otiatrii, 1927, in Zentralbl. f. Hals-, Nasen- u. Ohrenh. **11**:204, 1927.

24. Leto, L.: La mastoidite da simbiose fuso-spirillare, Pédiatria **35**:242 (May) 1927.

25. Motta, R.: Su due casi di otite media cronica con assoziazione fuso-spirillar, Policlinico (sez. prat.) **35**:83 (Jan. 23) 1928.

26. Leto, L.: Nuovo contributo alla conoscenza delle mastoidite da simbiose fuso-spirilare, Arch. ital. di otol. **40**:396 (June) 1929.

Treatment consisted first of removal of the tonsils and the adenoids, followed fifteen or twenty days later by systematic treatment for the discharge. From the start, washes with hydrogen dioxide, 3 per cent, were used. The patient did not return to the clinic until December 12. For a month and a half, he was treated daily with glycerinated mercuric chloride, 1:1,000. He was about well when he stopped coming to the hospital, and he never returned.

CASE 2.—S. C., a white boy, aged 8, a Brazilian living in Campinas, was admitted to the hospital on April 26, 1927, and was placed in the seventh infirmary (otorhinolaryngologic clinic). The parents said that the boy had suffered from infection of his ears for six years, with abundant discharge from both ears. There was little pain in the left ear; the pain in the right was not very intense.

Examination of the right ear showed the drum membrane perforated by a large opening, through which the mucous membrane obtruded in a pronounced hernia; it bled readily when touched. The drum membrane of the left ear was perforated; there was a large polypus of the tympanic cavity; bloody pus of characteristic odor, and lesions intensely sensitive to the touch. Poorly developed tonsils were present, with indications of chronic inflammation and follicular pharyngitis.

Treatment consisted of removal of the tonsils, followed about twenty days afterward by systematic treatment.

Microscopic examination of the pus from the left ear showed fusospirochetic symbiosis, in abundance, dominating the field. The ear was treated with glycerinated mercuric bichloride, 1:1,000 (mercuric chloride 1:1,000 and glycerin, equal parts). On May 18, the patient asked permission to leave the hospital as he was able to report daily. When he left he was almost well, and a month later he was completely cured.

CASE 3.—B. E., a white boy, aged 6, a Brazilian living in Campinas, was brought to my office in the Stevenson Hospital on May 21, 1928, by his father, who said that the child had suffered from his ear since he was 3 months old. There was abundant suppuration, especially on the right side. The right ear was painful, the pain being present only when the discharge ceased.

After examination, removal of the tonsils and adenoids was recommended. The operation was done September 1, and a month later systematic treatment of the ear was begun. At this time the patient complained of intense pain in both ears, which became more severe at night.

Examination of the right ear showed the external canal full of pus of a sickening odor. On the lower wall of the canal, almost touching the drum membrane, was a small superficial ulcer covered by a false membrane. The mucous membrane of the tympanic cavity was also covered with this false membrane. The left ear was full of abundant and very offensive pus; the mucous membrane was swollen, bleeding at the lightest touch.

Smears from the pus showed Le Dantec-Vincent germs in large numbers.

Treatment consisted first of cleansing and drying of the canal, followed by the application of an oil emulsion of iodobismuthate of quinine, 30 per cent. The odor disappeared in three days, though the abundant discharge, now changed in color, continued. In it only a few isolated germs of the symbiosis were found. The small ulcer in the canal healed, and the pain disappeared a few hours after the first application of bismuth.

CASE 4.—V. C., a white man, aged 20, a shoemaker, living in Vila Rezende, Piracicaba, presented himself at the Santa Casa Hospital on Dec. 20, 1926, with a history of little significance, except for the presence of syphilis, and his habit of taking several glasses of liquor daily.

Shortly after the syphilitic splotches on the skin had yielded to treatment, the left ear began to ache. Some days later, the pain, then present in both ears, became very severe, diminishing slightly when suppuration set in, which was abundant and of a repulsive odor.

On examination I found the right and left external canals full of dark, bloody pus of a characteristic odor. After cleansing, I discovered on the walls of the canals small, pointed protuberances, similar to hard papillomas, almost completely closing the canals.

Since the Wassermann reaction was positive (3 plus), I prescribed antisyphilitic treatment. After the patient had taken 3.20 Gm. of neoarsphenamine and twenty injections of iodobismuthate of quinine, the ear was still in the same condition, despite the daily use of glycerinated mercuric chloride, 1:1,000. For this reason I proceeded to scrape the canal, with the patient under ether anesthesia.

From the start the smears revealed the almost exclusive presence of the fusiform bacilli and spirochetes in the secretion from the ear. After the use of 3.80 Gm. of neoarsphenamine and twenty-two injections of bismuth, the germs persisted in the pus. I then decided to employ bismuth, 30 per cent locally. The patient was not cured of the otitis media, but in forty-eight hours the pain and the bad odor ceased, and it was no longer possible to find Le Dantec-Vincent germs in the smears of the pus.

Three days after a fresh scraping of the canal, the patient was given another injection of neoarsphenamine. Twenty-four hours later jaundice set in, and forty-eight hours afterward the patient died of acute yellow atrophy of the liver.

The pathologic examination of the small tumors of the canal, made by Dr. Marcos Lindenberg, showed granular oitis and vegetative papillomas. Dr. Lindenberg reported as follows: On macroscopic examination, four small specimens of different shapes were seen; two were round, being about 3 mm. broad, 4 mm. long and 3 mm. high; the other two were of undefined outline. They were of slight consistency; only one had a wrinkled, though regular, surface. They were red, and were covered with a bloody secretion, which was partially detached when they were immersed in the stains. Three were submitted to the usual staining processes, and the last was treated by Fontana's method.

On microscopic examination, all the sections made of the specimens had the same histologic character. All showed a dermal and an epithelial covering and, over this, material derived from the secretion of the canal and from copious inflammatory exudation.

There were numerous pyocytes, in more or less advanced stages of decomposition, red blood corpuscles and germs.

The highly stratified epithelium was flat and high. It was undergoing necrosis and exfoliation on the surface, the disengaged particles mixing with the exudate. The whole was shot through from the bottom to the surface with moving inflammatory cells, especially polymorphonuclear cells, which were countless throughout the epithelium. However, the chief fact with regard to this tissue was its active proliferation. In the lower layers were many cells in mitosis, and nuclei which, besides structural modifications of the chromatin, showed greater affinity for the stains, a significant indication in the same direction.

This epithelial proliferation was apparent in two ways: through the greater height of the epithelium, the layers of which were multiplied, and through the productions of folds and epithelial projections down into the mass, either by invagination, which pushed apart other papillae, or as true epithelial offshoots and prolongations into the derm. The fresh growth of very dense and close

papillae, covered with thick infiltrated epithelium, gave the process a vegetative character, which in one of the specimens actually took on the character of a small papilloma. This was a case of a hypertrophic epithelial process, acute but prolonged.

The derm was the seat of intense chronic and purulent inflammation. It was densely permeated by inflammatory cells, among which the polymorphonuclear, the lymphocytic and the plasma cells predominated.

There were visible some large conjunctival cells, rare eosinophils and some full blood vessels, shooting out small capillary arteries and veins into the papillae. From these especially there was active diapedesis of leukocytes, which in turn passed through the epithelium and reached the surface. No dermal nodules or giant cells were found.

The Fontana stain of one of the whole specimens showed the copious and almost exclusive presence, in the superficial exudate, of spirochetes well stained with black, and of fusiform bacilli, on the surface of which was a deposit of silver like a covering. There, in the midst of the pyocytes, the spirochetes frequently were massed by the hundreds. Hence they penetrated through the surface of the epithelium and down to its depths, that is, two or three cell layers below the extremity of the papillae. No fusiform bacilli were seen in this region, probably because the stains could not color them.

COMMENT

I am not able to determine certainly whether other references to cases in the literature on this subject really refer to fusospirochetic otitis or to otitis in the secretion of which Plaut-Vincent's symbiosis is found. Among the cases reported are: (1) one case of otomastoiditis by Hartwich,[27] (2) two cases of chronic otitis by Accorinti,[28] (3) two cases of otomastoiditis by Busacca,[28] (4) one case of otomastoiditis with generalized sinus thrombosis by Busacca,[28] (5) four cases of chronic otitis by Barbieri,[28] (6) one case of acute otitis media by Waldapfel[29] and (7) one case of otomastoiditis by Deutsch.[30]

Waldapfel,[29] in reporting his case, said that it was the first in which the symbiosis was found in acute otitis, though there were already six recorded cases associated with chronic infections. In the same year Raspopoff[18] asserted that his was the first case seen in Russia and the twenty-first in the world. Despite a careful search of the literature, I have not been able to find more than twenty-five cases up to the present,

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27. Hartwich: Ueber die fuso-spirilläre Assoziation bei Otitis media, Zentralbl. f. Bakteriol. **84**:535, 1920.

28. Cited by Caliceti, P.: Sul valore dell'assoziazione fuso-spirilare nelle otite medie croniche, Arch. ital. di otol. **39**:363 (June) 1928.

29. Waldapfel: Bacille fusiforme et spirochète de Vincent dans l'oreille moyenne, Soc. Autr. d'otologie, July, 1923, in Arch. internat. de laryng. **3**:200 (Feb.) 1924.

30. Deutsch: Bacille fusiforme comme agent d'une otite aigue, Soc. Autr. d'otologie, December, 1923, in Arch. internat. de laryng. **4**:854 (July-Aug.) 1924.

to which I have added four. I may point out that in many cases of chronic purulent otitis I have found the elements of the fusospirochetic symbiosis, at times quite abundant. However, they did not predominate in the field; neither the symptoms nor the lesions were typical of the condition, and treatment with bismuth did not produce improvement in the patients. This leads me to consider as not very important the mere presence of the symbiosis in the pus in otitis, and this occurs more frequently than is supposed. If Plaut-Vincent's symbiosis is seen in almost 100 per cent of the cases in which the hygiene of the mouth is neglected and if otitis media is usually only the result of nasal, mouth or pharyngeal infections carried to the tympanic cavity through the eustachian tube, it is clear that the presence in the pus in these otitic conditions of the germs of the symbiosis cannot be as important as has been supposed.

CLINICAL TYPES

From my observation and reading of foreign publications, I have come to the conclusion that fusospirochetosis of the ear presents itself in two clinical forms, or types: the diphtheroid and the ulceromembranous. In reality these are not clinical types but phases of development. At the start, the small, yellow lesion is covered by a yellowish false membrane. As the process develops, however, the ulcer deepens, and shows itself no longer covered by a simple membrane but full of a dark, thick secretion, partially adherent to the lesion, which serves as its base. What happens is what takes place in other localizations of the disease, especially in Plaut-Vincent's angina. In fact, at present the two recognized types of the disease are those to which I refer, the description of which is usually credited to Vincent. This author did not, however, describe two clinical forms, as is said, but simply pointed out that the condition, in the beginning, presents itself in the form of lesions covered by false membranes, and that as it develops these assume a necrotic character.

There is, however, a special clinical form, described by Ottoni de Rezende [31] under the name of gangrenous perichondritis, which is observed in convalescence from eruptive fevers and which is extremely serious. I am not certain that such cases are not noma of the ear (Bezold). For this reason I do not, at the present time, include this form in the study of fusospirochetosis of the ear, as in my opinion it has not been proved that noma is a fusospirochetal lesion.

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31. Ottoni de Rezende, M.: Sobre um caso de pericondite gangrenosa do pavilhao e do conduto com invasão do ouvido médio, Bol. d. Soc. med.-chir. de São Paulo **2**:133 (Aug.) 1919; Terceiro e quarto casos de pericondite gangrenosa do pavilhão e do conduto com invasao do ouvido médio, ibid. **3**:73 (May) 1920.

Fusospirochetosis develops at various points in the ear. Its most external localization is in the auricle. For example, in Benjamins'[32] case, which for lack of data I do not include among those published, one has a clear instance of local cutaneous fusospirochetosis; that is, a true "tropical ulcer" located in the lower part of the concha, in the lobule and in the tragus. This author described the case as "tropical ulcer," which is just what it was. In Cheatle's cases,[14] the lesions, covered with membranes, were only in the meatus.

Then there is the true external otitis. The lesions appear in the external canal (rarely in the tympanum), and even in the auricle, and generally in the choncha. These are the most frequent cases.

Otitis media is rarer, and still more rare is mastoiditis. Fusospirochetosis of the mastoid, like otitis, may be acute or chronic. There are on record only two cases of the acute type. These are the cases reported by Leto in 1927 [24] and in 1929.[26] In certain cases, as in that of Mouret and Cajezust,[17] the process may extend to the meninges. In their case the symbiosis was found in large quantities in the cerebrospinal fluid, which had the characteristic odor. Busacca,[28] in a case of thrombosis of the sinuses of the dura, found the germs in the coagulum which was drawn off.

SYMPTOMS

As I have shown in previous studies, fusospirochetosis, wherever located, is always characterized by three principal symptoms: an ulcer covered by false membrane, foul odor and pain.

In the ear, the ulcerous lesion usually shows itself on the walls of the external canal and exceptionally in the concha or other points of the external ear. The ulcer has regular edges cut straight, and is covered by false membranes or by a dark mass. It may, however, deepen as it develops and become full of necrotic tissue.

The lesions of the skin of the external canal sometimes show characteristics which are typical but which have not been encountered in the disease elsewhere. I think that they are dependent on the special morphology and ventilation of the canal. Such characteristics are the frequent granulations, soft or hard, and the ready bleeding, which appear in the external canal or in the cavity. I would here call attention to the formation of small papillomas in my last case, in which the histologic examination showed the presence of spirochetes. I have found no reference to this condition in the literature.

The foul odor is typical and unmistakable. This symptom, on which I insist, has been noticed by many authors, and as Leto [26] says, it is this factor that suggests fusospirochetosis.

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32. Benjamins, C. E.: "Tropenkrankheiten des Ohres," in Denker and Kahler: Handbuch der Hals-, Nasen- und Ohrenheilkunde, 1926.

The pain is violent and terrifying, and usually is more intense at night. Most observers stress this symptom.

To these three signs others, infrequent though not unimportant, should be added. First is the color of the secretion. It is always dark, sometimes bloody, varying from brownish yellow to dark brown and purplish. The quantity is another sign. The flow is always abundant. In my first case, the bedding had to be changed daily. The ganglial reactions, which in this case also were violent, are not constant. The periaural ganglions are usually the ones attacked. Fever is not always present. The same is true of loss of appetite and of the feeling of general discomfort. These signs are noticed only when pain sets in.

These symptoms are less pronounced in the middle ear. The mucous membrane of the cavity at certain points sometimes shows false membranes; this, however, is the exception. All that is noticeable is that the mucous membrane is inflamed and hyperemic, bleeding at the slightest touch.

PATHOLOGIC ANATOMY

Having consulted almost all the literature bearing on fusospirochetic otitis, I think that I may risk saying that its pathologic histology has not yet been studied. All that exists on the subject is the report cited in my last case.

DIAGNOSIS

The diagnosis is not difficult. Calamida [8] stated the belief that it cannot be made except after microscopic examination. I dissented from this point of view in my first published study, and I maintain my opinion. If it is possible to arrive at a sure diagnosis of "tropical ulcer" or Plaut-Vincent's angina by simple clinical examination, I see no reason why fusospirochetic otitis should be an exception. There are cases, but they are not typical, in which only the microscopic examination will guarantee diagnosis. It is superfluous to say that such an examination is always useful. It does not, however, seem to me reasonable to consider microscopic examination indispensable.

When I saw a case of granulations along the external canal for the first time, I thought that I was dealing with sharp, pointed condylomas. As may be gathered from Benjamins' observation, they are of similar appearance in the canal. These are real warts. Their presence, I think, has been noticed only in members of the yellow race.

PROGNOSIS

In general, the prognosis is favorable. In patients decidedly undernourished, theoretically at least, it is to be feared that the condition may

take a violent and destructive course, such as I have noticed in "tropical ulcer." In the mastoid the disease is always more serious, and demands special care.

ETIOLOGY

I have little to say with regard to the etiology, but refer the reader to what I have previously published. Still it is well to note that (1) fusospirochetic otitis is no respecter of ages but occurs more frequently in children (of my five cases, four were in children); (2) it is more common in rural districts, and (3) it is seen more often in persons who are not clean. The unquestionable relation known to exist between certain localizations of fusospirochetosis and the degree of moisture in the air or soil cannot yet be proved true of the otitic form.

PATHOGENESIS

It should be clearly understood that fusospirochetosis is always a secondary disease. Otitis media may be complicated by a fusospirochetal infection because of the easy communication between the cavity and the mouth. Contamination occurs externally, carried by small mosquitoes, which I have found several times in the pus in otitis. If the infection is from without, it is necessary that there should be some injury to the skin. This irritation or abrasion may be caused by the introduction of any foreign body into the canal, even the finger. Cheatle [14] raises the question of the infection having arisen from this cause in his cases, since the lesions were very near the surface, and the patient suffered from ulceromembranous stomatitis.

There are some authors who question the pathogenic action of the fusospirochetic symbiosis not only in the ear but in other parts of the body. Present knowledge no longer admits that this be questioned, rendering it unnecessary to go into details, for the rôle of Le Dantec-Vincent germs has been proved.

THERAPY

Much has been written on the treatment for fusospirochetosis. It would be out of place to repeat here what I have said in previous studies. In my article on the etiology and etiologic treatment for Plaut-Vincent's angina,[33] I refer to about sixty therapeutic procedures which are easily applicable in this disease localized in the ear. In short the specific treatment for fusospirochetosis consists solely in the use of neoarsphenamine and bismuth.

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33. Mangabeira-Albernaz (footnote 1, last reference).

Salvadori,[34] having employed various procedures, decided that the best was the administration of neoarsphenamine. The same conclusion is to be inferred from Motta's [25] studies. My experience proves just the contrary. Bismuth, besides being far more active, is not painful, is more economical, and stops the pain instantaneously. I believe that the Italian authors have failed because of the small doses of bismuth employed. They (at least Motta) used it in 5 per cent strength, whereas I used 30 per cent concentrations.

I have obtained cures within a few hours. In the first case, I instilled into the canal 5 drops of the oil emulsion at 30 per cent. The microscopic examination before this application revealed a veritable tangle of spirochetes and a great number of fusiform bacilli. The secretion was most abundant. Twenty-four hours after the treatment, material had to be withdrawn from the bottom of the canal, for the flow had ceased. The microscopic examination showed in the richest field 15 spirochetes and 9 bacilli. I do not care to refer here to the unquestionable advantages of the bismuth in this disease in other localizations. For a discussion of this aspect reference may be made to other published studies of mine.

Intravenous injection of neoarsphenamine, held by many to be most efficacious, proved of no value in the fifth case that I recorded. The local use of bismuth none the less gave the best results.

I also tried an acriflavine gentian violet mixture in the fourth case, which Abraham [35] thought unequaled in the treatment for fusospirochetosis. The result was not good, as the disease was checked only when I returned to the use of bismuth. Mercuric chloride, 1:1,000, with glycerine (equal parts) was also used, but its effects were very slow.

I have little to say of the technic. I usually employ sodium potassium bismuth tartrate, potassium acid bismuth tartrate and, more commonly, iodobismuthate of quinine, all in emulsion of 30 per cent. After carefully cleansing the canal and tympanic cavity, I instil some drops of bismuth and close the meatus with cotton. The treatment is repeated every twenty-four hours, but in severe cases it may be done twice a day. For the lesions on the skin of the external ear, whether or not they involve the cartilage, I do not hesitate to recommend the treatment I have prescribed for "tropical ulcer," that is, the direct application of pure powdered bismuth salts to the lesions.

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34. Salvadori, G.: La terapia delle otorree a reperto fuso-spirochetico, Arch. ital. di otol. **36**:705 (July) 1925. Busacca, G., and Salvadori, G.: Alcuni rilevi sul trattamento arsenobenzolico delle otorree a reperto fuso-spirochetico e sul valore medico-legale di questro reperto, Arch. ital. di otol. **36**:107 (Feb.) 1925.

35. Abraham, J. H.: The Use of Gentian and Acriviolet in Infections of the Upper Respiratory Tract and Ear, Laryngoscope **34**:637 (Aug.) 1924.

CONCLUSIONS

1. Fusospirochetosis, a specific disease, may attack the ear, settling in any part of the organ.

2. Fusospirochetic otitis is characterized by the triad of symptoms of fusospirochetosis (ulcer with false membrane, foul odor and pain), to which may be added a copious purulent discharge and granulations in the canal and the tympanic cavity.

3. The disease is present in persons of all ages and races, and in both sexes, attacking unclean persons more frequently.

4. Fusospirochetosis of the ear, as is true of the other types, is a secondary lesion, the germs coming from the mouth through the eustachian tubes, or being brought from without by foreign bodies or insects.

5. The diagnosis presents no difficulties.

6. The prognosis is favorable, but when the disease is located in the mastoid the outcome is more uncertain.

7. The speediest and most efficient treatment consists in the daily instillation of a 30 per cent bismuth emulsion after proper cleansing of the canal and the tympanic cavity.

ADDENDUM

This study was reported to the Tenth Medical Congress of Brazil in July, 1929, and was forwarded to the editor of the ARCHIVES in the middle of November of the same year. Some studies of real interest bearing on fusospirochetosis of the auditory tract have since been published.

Busacca [36] recorded three cases of complication in otitis media due to the fusospirochetic symbiosis. His principal conclusion is: one has no right to speak of Vincent's otitis media with the same certainty with which one may speak of the stomatitis, of the angina and of the otitis externa.

Joukowsky [37] described a typical case of fusospirochetic otitis reported in 1921. He added that in the same year he made a report on this subject to the Otological Society of Petrograd. In his study, Joukowsky referred to eight articles which I was not able to consult, and therefore do not touch on in my paper. One of these is by Halster,

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36. Busacca, G.: Sur l'importance de l'association fuso-spirochétique dans les complications des suppurations chroniques de l'oreille, Arch. internat. de laryng. **8**:295 (March) 1929.

37. Joukowsky, A.: A' propos de la fuso-spirillose de l'oreille, Ann. d. mal. de l'oreille, du larynx **48**:1023 (Oct.) 1929.

and was communicated to the American Laryngological Association (XXXIV Congress); another is by Adam, and this was published in the *Journal de Laryngologie* in 1921. The remaining cases were registered in Russian periodicals. They are by Trutnev, Fain, Wolfshon, Solomonoff, Krinskaia and Rossoff. Trutnev in his work referred to two cases observed by Feldmann, which were reported in 1906, and therefore antedate those of Gerlach.

In a recent work of Barenberg and Lewis [38] one sees, however, that priority in the description of fusospirochetic otitis belongs to Held,[39] and not to Feldmann. This case was studied in 1905. Priority in the description of the mastoiditis belongs to Yates [40] (1909). Barenberg and Lewis published the report of three cases of otitis produced by the symbiosis.

Trutnev,[41] in 1928, published the report of a detailed study of the fusospirochetic mastoiditis based on the observation of twelve cases, arriving at the conclusion that Vincent's mastoiditis should be looked on as a distinct disease.

Fanton [42] related a case of chronic otitis media followed by mastoiditis caused by the combination of Vincent's spirocheta and Le Dantec's bacillus.

Rua Conceicao, 260.

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38. Barenberg, L. H., and Lewis, J. M.: Vincent's (Fusospirillary) Infection of the Ear, J. A. M. A. **94**:1065 (April 5) 1930.

39. Held, R. J.: Vincent's Bacillus and Spirillum the Causal Agent of Chronic Suppurative Otitis Media Necessitating Radical Operation; Meningitis; Death, Post Graduate **21**:357, 1906.

40. Yates, D. G.: Mastoiditis Due to the Micro-Organisms of Vincent's Angina, J. A. M. A. **53**:116 (July 10) 1909.

41. Trutnev, V.: Soll die Affektion des Warzenfortsatzes durch das spindelfoermige Staebchen in der Symbiose mit der Spirochaete als eine selbstaendige Form der "Vincentschen Mastoiditis" abgesondert werden? Vestnik. Rino-i pr. iatrija **3**:489, 1928; Zentralbl. f. Ohrenh. **13**:831, 1929.

42. Fanton, E.: Sopra un caso di meningite purulenta da spirocheta in bambino, Clin. pediat. **9**:177 (Sept.) 1927.

RADICAL MAXILLARY SINUS OPERATION (CALDWELL-LUC)

SUMMARY OF CLINICAL AND HISTOLOGIC OBSERVATIONS ON ONE HUNDRED PATIENTS *

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This series of cases covers patients coming to the outpatient clinic of the otolaryngological department of the Massachusetts Eye and Ear Infirmary, in the service of Dr. H. P. Mosher. These are successive cases and not selective. Cases in which there was a history of asthma, however, are not included, as they will be reported in a separate article.

INCIDENCE

There were two patients less than 10 years of age, one being 1½ and the other 5½ years. There were fourteen patients between 10 and 20 years of age, forty between 20 and 30, fifteen between 30 and 40, seventeen between 40 and 50, nine between 50 and 60 and three between 60 and 70, the oldest being 63.

There were fifty-two primary radical Caldwell-Luc operations on the right side and fifty-one on the left; eleven secondary operations on the right and nine on the left. Among these there were twenty-five bilateral operations, twenty of which were primary and four secondary.

PREVIOUS OPERATIONS

These patients had had other operative work done previously or in conjunction with the operation on the antrum: An intranasal antrum operation had been performed on the right side in six patients, and on the left in nine; an anterior ethmoid operation on the right in fourteen, and on the left in twelve. Fourteen patients had had a submucous resection. In twelve, nasal polyps had been removed. The anterior tip of the middle turbinate had been removed on the right side in eight, and on the left in four. In one, the whole inferior turbinate had been removed, and in one the sphenoid had been opened and drained.

Lavage of the antrums had been performed in thirty-seven cases, the antrums being washed from one to nine times without relief from the symptoms.

LOCAL SYMPTOMS

In fourteen patients there was pain and tenderness on the same side of face as the antrum affected, and in one patient on the opposite side

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of the face. Four patients had pain over the frontal regions, and two behind the eyes. Six had pain over the eye, two under the eye, and one at the side of the nose on the same side as the affected antrum. Four patients had swelling of the face on the same side, and one a sense of fulness in both cheeks. Thirty-three complained of frontal headache of varying intensity. Sixty-four did not give a history of headache. One complained of severe headache over the vertex, one over the occiput and one behind the eyes. Forty-eight had a bilateral and thirty-one a unilateral nasal discharge; twenty-one gave a negative history for nasal discharge; only thirty of one-hundred patients gave a history of postnasal discharge. Nineteen had bilateral and twenty-one unilateral nasal obstruction. Only twenty-three had frequently recurring colds. In ten patients cough was a prominent symptom. In five cases arthritis was an associated condition.

ASSOCIATED CONDITIONS

Only one patient was proved to be tuberculous; there were clinical signs at the apex of the left lung, confirmed by roentgenograms. Twenty-eight of the patients had had the tonsils removed previously; seven of the remaining patients showed active infection in the tonsils.

Only one Wassermann reaction was found to be positive.

The histories showed activity of the disease from three weeks to fifteen years.

The gross observations on the antrums were as follows: In thirty-one patients the antral lining was markedly thickened; in four the antrum were filled with fibrous membrane; in forty-seven the antral lining was polypoid, and in eight appeared practically normal; in one the antrum was completely filled with a large cyst; in three there were cysts of various sizes; in eleven the antrums were completely filled with polyps; in nine the antral lining appeared necrotic, and in nine the condition was not noted.

In only three cases could the teeth be definitely regarded as the point of origin of the infection.

Osteomyelitis was a complicating factor in two cases. One patient had an osteomyelitic area in the superior maxilla, but recovered from this condition under treatment. In the other patient osteomyelitis of the left temporal bone and brain abscess developed; this was the only instance of death.

PATHOLOGIC OBSERVATIONS

Subepithelial infiltration was a noticeable feature in two thirds of the cases, and it ranged from very slight to very dense—from a small number to dense masses of cells that formed a distinct infiltrating band. The predominating cells were plasma cells and small lymphocytes.

For purposes of comparison, the infiltration was studied in a series of slides with the following index: +, ++, +++, ++++.

	—	+	++	+++	++++
Plasma Cells	10	30	42	21	6
Lymphocytes	4	52	32	16	5

A slide might show a + subepithelial infiltration of plasma cells with a ++++ number of lymphocytes or any combination. In other words, the clinical symptoms and gross observations in the antrums were not indicative at all of the nature of the infiltration.

The epithelium was found to be entirely absent in many instances, although care was taken to cut the sections so that the epithelium would be shown if present. In others it was intact, showing cilia and goblet cells.

Glandular hyperplasia was not a marked feature of the sinus mucous membrane, there being from slight (twelve cases) to moderate hyperplasia (twelve cases), with definite cystic changes in six.

The degrees of edema of the mucous membrane are indicated by +, ++, +++ and ++++ in the following tabulation:

Age	+	++	+++	++++
20 to 30	10	17	10	5
31 to 40	4	5	8	2
41 to 50	6	4	6	0
51 to 60	3	3	0	0
61 to 70	1	1	0	0

Observations on the fibrosis of the mucous membrane were:

Age	+	++	+++	++++
20 to 30	4	6	2	1
31 to 40	1	1	2	0
41 to 50	0	3	0	0
51 to 60	1	2	1	0
61 to 70	0	0	0	0

SECONDARY RADICAL OPERATIONS

Of the sixteen patients on whom a secondary radical operation was performed, and of twenty whose sinuses were operated on, one had relief for four years, another for three years and two for one year. All the others returned for operation within a period ranging from two and one-half to nine months. The predominating symptom on the return was a bilateral nasal discharge, and the next most frequent was pain. In two of the antrums that were opened, definite septal partitions were found consisting of thickened, fibrous membrane. Seven antrums had definitely polypoid membrane, and in six it was definitely thickened. In nine antrums there was free pus.

SUMMARY

The greatest incidence was in young adults. One third of the patients had frontal headache as a definite factor, while two-thirds did not complain of this at all. Practically 50 per cent of the patients gave a history of bilateral nasal discharge. Less than one-fourth had frequent, recurring colds. Only 14 per cent had pain over the antrum. In 3 per cent the condition was secondary to infected teeth. Lavage of the antrums had been performed in a little over one third of the cases. One fourth of the patients had a bilateral operation. In only five cases was there a history of associated arthritis. In both edema and fibrosis of the mucous membrane it was found that the young adult, from 20 to 30 years of age, showed the widest degree of change.

The question is: Does mucous membrane regenerate or does it form scar tissue? The mucous membrane does regenerate. How well it does so probably depends on the amount of infection remaining in the nose and sinuses. In the series of cases on which this paper is based, nineteen of the twenty secondary radical antral cavities contained mucous membrane that had regenerated.

Drs. C. D. Knowlton and Gregor MacGregor proved this in their experimental work on dogs. As they were extremely interested in this question, they were asked to look over the slides, and they concurred in the observations.

CONCLUSIONS

There are no distinct observations that would enable one definitely to correlate the patient's symptoms with the pathologic picture.

There is definite subepithelial infiltration of plasma cells and lymphocytes, but this occurs in cases without marked clinical symptoms as well as in those with symptoms.

The toxic agent and the degree of immunity of the patient would seem to govern the pathologic changes.

As long as there is disease left in the nose there may not be satisfactory regeneration of the epithelium and probably not a satisfactory clinical result.

APPENDICITIS FOLLOWING TONSILLECTOMY

REPORT OF TWO CASES *

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Appendicitis following tonsillectomy is apparently not common, judging from the literature, as a careful search failed to reveal any cases reported.

That such a relationship may exist is probable, for during recent years it has become increasingly evident that appendicitis or peritonitis may follow acute or chronic tonsillitis.

Kelynack,[1] in 1893, first called attention to the possibility of appendicitis following tonsillitis. Adrin,[2] in 1901, succeeded in producing appendicitis in rabbits by injecting staphylococci, streptococci, pneumococci, *Bacillus typhosus, B. coli, B. anthracis* and tubercle bacilli into the blood stream. Tedesco later confirmed Adrin's results, using staphylococci, streptococci and *B. anthracis.*

In 1916, Anderson [3] reemphasized the apparent relationship between infection of the upper respiratory tract and that of the appendix. That such a relationship exists is suggested by the similar lymphoid tissue in each structure and by the frequently noted increased incidence of appendicitis during an epidemic of throat infections.

Evans,[4] of the University Clinic of Madison, Wis., reported eight times as many cases of appendicitis during the time of an epidemic as when there was no epidemic. He found an infection of the upper respiratory tract in 86 per cent of his cases of appendicitis.

Regarding the relationship, Richter [5] stated: "The presence of a previous acute naso-pharyngeal or respiratory infection is probably of importance in a fair number of cases in inaugurating an acute attack." Such a history was present in 7 of 172 cases (4.06 per cent) in the series studied by him. Focal infections of the tonsils, cervical glands, teeth or ears were noted in 42 of 172 cases (24.41 per cent).

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* Submitted for publication, Feb. 19, 1930.

1. Kelynack, T. N.: A Contribution to the Pathology of the Vermiform Appendix, London, 1893, p. 97.

2. Adrin, C.: Mitt. a. d. Grenzgeb. d. Med. u. Chir. **7**:407, 1901.

3. Anderson, H. B.: Am. J. M. Sc. **150**:541, 1915.

4. Evans, J. S.: Wisconsin M. J. **17**:91, 1918.

5. Richter, H. M., in Abt, I. A.: Pediatrics, ed. 3, Philadelphia, W. B. Saunders Company, 1924, p. 558.

Feer [6] reported an incidence of 7.5 per cent of simultaneous involvement of the tonsils and the appendix in his cases.

Brennemann [7] stated that he is "convinced that many cases of appendicitis in children occur during and as a complication of, or sequel to, an infection of the throat." He further stated that in 35 appendectomies at the Children's Memorial Hospital, 17 per cent unquestionably occurred during the course of a very evident throat infection. In the last 10 cases of appendicitis in his private practice, 9 patients had a definite throat infection.

Hunt [8] reported 95 cases of appendicitis, in 46, or almost 50 per cent, of which an acute throat infection was present.

Nearly all observers are convinced that this relationship exists. However, the method by which the transmission of the infection from the throat to the appendix occurs is not so clear; whether the bacteria are carried by the alimentary canal, the lymph system or the blood stream is still a matter of question. Possibly all three channels are used at times.

That infection may be transmitted by way of the alimentary tract was demonstrated by Chastenet, who obtained a subsequent appendicitis in rabbits by feeding them with pathogenic bacteria.

That the infection is transmitted by way of the blood stream in many cases is becoming increasingly evident. Poynton and Payne [9] reported a case in which they seem to prove almost conclusively that a cause of appendicitis may be a streptococcal invasion through the blood stream from follicular tonsillitis.

The possibility of primary peritonitis secondary to a throat infection by way of the blood stream has been denied until recent years. Kunzler,[10] in 1904, reported the first positive case. He recovered the same organism from the throat, blood and the peritoneal cavity. No intraperitoneal lesion was found at necropsy.

Chapelle [11] at a later date reported 18 cases of rapidly fatal peritonitis occurring in children during an epidemic of throat infections. The same organism was recovered from the throat, blood and peritoneal cavity.

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6. Feer, E., in Pfaundler and Schlossman: Handbuch der Kinderheilkunde, ed. 3, Leipzig, F. C. W. Vogel Company, 1927, vol. 3, p. 274.

7. Brennemann, Joseph: Abdominal Pain of Throat Infections in Children, and Appendicitis, J. A. M. A. **89**:2183 (Dec. 24) 1927.

8. Hunt, Wesley M.: Am. J. Surg. **6**:761 (June) 1929.

9. Poynton, F. J., and Payne, A.: Lancet **2**:439 (Aug. 17) 1912.

10. Kunzler: München. med. Wchnschr. **51**:1920, 1904.

11. Chapelle: Arb. a. d. path. Inst. zu Helsingfors **2**:583, 1907.

Rabinowitz,[12] Ransohoff and Greenbaum,[13] MacLennan and McNee,[14] Rowe[15] and others have reported similar cases of primary peritonitis following throat infections.

These cases of appendicitis and peritonitis following an acute infection of the throat are frequently atypical. They have a tendency to flare up suddenly, with the production of an early gangrenous condition; hence the gravity of these cases. This occurs especially in children, as exemplified by the patient in case 2. If the infection is transmitted by way of the blood stream, the appendicitis may be only part of a generalized infection.

REPORT OF CASES

CASE 1.—*History.*—M. R., a girl, aged 5 years, was admitted to the Evanston Hospital on April 30, 1929, with a history of mouth breathing, snoring, frequent colds, sore throats and an occasional earache, with two instances of a supervening acute suppurative otitis media. There was no history of a previous attack of appendicitis, recent cold in the head or sore throat.

A general examination revealed a well nourished child apparently normal in every respect except as noted. She had the facial aspect of a child with a large adenoid. The tonsils were very large, almost meeting when she opened her mouth. No acute inflammation of the nose or throat was evident. A large adenoid mass was present, almost filling the epipharynx. A chronic enlargement of the cervical glands, without tenderness, was found.

The tonsils were removed by a modified Sluder tonsillectome with the patient under nitrous oxide-ether anesthesia. The adenoid was removed by means of a LaForce adenotome followed by an adenoid curet. There was no unusual amount of bleeding at the operation and none after the patient left the operating room. No postoperative nausea occurred. The temperature on admission was 99 F. (rectal), and at 5 p. m., eight hours after the operation, it was 99.2 F. (rectal).

Microscopic examination of the tonsils revealed hyperplasia of the lymph follicles, necrotic epithelium, leukocytes, pseudoray fungi and masses of bacteria in some of the crypts. There was necrosis of the lining of the crypts in places.

Microscopic examination of the adenoid showed a hyperplasia of the lymph follicles and the presence of pseudoray fungi. The pathologic diagnosis was chronic hyperplastic and lacunar tonsillitis and hyperplastic adenoiditis.

Convalescence following the tonsillectomy and adenoidectomy was normal, with possibly less discomfort than is usual in children of an equal age. On May 2, 1929, the second day following the operation, the patient suddenly complained of pain in the abdomen. The pain was accompanied by a rise in temperature to 101 F. and a leukocyte count of 18,000. A diagnosis of acute appendicitis was made, which was confirmed by operation by Dr. Frederick Christopher the same day.

The pathologist's report on the appendix was as follows: "Appendix 5 cm. long by 0.7 cm. in diameter. The serosa is gray-red mottled with purple. Thin

12. Rabinowitz, M. A.: Am. J. M. Sc. **157**:797, 1919.

13. Ransohoff, J. L., and Greenbaum, J. V.: Acute Appendicitis and Pneumonia in a Baby 14 Months of Age, Am. J. Dis. Child. **28**:76 (July) 1924.

14. MacLennan and McNee: Brit. J. Child. Dis. **10**:258, 1913.

15. Rowe, Olin W.: Minnesota Med. **6**:652 (Nov.) 1923.

layer of fibrinopurulent material on appendix. Lumen is patent throughout and contains thick yellow purulent material. The mucosa is grayish pink and necrotic in a few places. Diagnosis: Acute fibrinopurulent appendicitis."

Recovery following the appendectomy was uneventful. The appearance of her throat at all times subsequent to the tonsillectomy was entirely normal.

CASE 2.—*History.*—L. D., a girl, aged 5 years, was admitted to the Evanston Hospital on Aug. 8, 1929, with a history of frequent colds and sore throats, with mouth breathing and snoring most of the time during the past year. Palpable glands (chronic) of the anterior cervical chain were present on both sides.

Examination revealed a well nourished child with no past history of importance except as noted. Her tonsils and adenoid were very large, with no evidence of an acute infection and with no history of a recent cold or sore throat. Her temperature on admission was 98.4 F. (rectal). The tonsils were removed by a modified Sluder tonsillectome with the patient under nitrous oxide-ether anesthesia. Very little bleeding occurred. The adenoid was removed by a La Force adenotome followed by an adenoid curet. The child's temperature at 5 p. m. on the day of operation was 99.8 F. (rectal). No postoperative nausea or bleeding occurred.

The pathologist's report on the tonsils was: "Hyperplasia of the lymph follicles; necrotic epithelium and leukocytes in the crypts; masses of bacteria in some of the crypts; pseudoray fungi present; leukocytic invasion of the crypt walls in places."

The pathologist's report on the adenoid was: "Marked hyperplasia of the lymph follicles; necrotic material and leukocytes in a few crypts. Diagnosis: Chronic hyperplastic and lacunar tonsillitis; hyperplastic adenoiditis."

The day following the tonsillectomy she felt very well, but during the night of the following day she complained of pain in her abdomen with nausea. Vomiting and fever accompanied the pain. The mother reported her condition to me the following morning, and I saw the child about 9 o'clock. A diagnosis of acute appendicitis was made. She was sent to the Evanston Hospital the same morning, where the abdomen was opened by Dr. Frederick Christopher, who found a gangrenous appendix with a localized peritonitis. The appendix was removed without inversion of the stump. Cigaret drains were inserted.

The patient had a continuously high fever, finally becoming toxic. Death occurred on the third day after the appendectomy, on Aug. 26, 1929, which was the sixth day after the tonsillectomy.

The pathologist's report on the appendix was as follows: "An appendix 5.0 cm. long by 0.8 cm. in average diameter. The serosa is grayish red and covered with a layer of fibrinopurulent material which is thicker in the distal end. The wall in this region is soft and necrotic, but no perforation can be grossly distinguished. The lumen is patent but obstructed in the middle by a moderately firm fecolith, 0.7 cm. in diameter. Distal to this the lumen contains sanguinopurulent material with a yellowish-gray and necrotic mucosa. Proximal to the fecolith the mucosa is grayish-pink and smooth. Diagnosis: Acute fibrinopurulent appendicitis with fecal concretion."

COMMENT

In both instances, symptoms of appendicitis began during the night of the second postoperative day, with removal of the appendixes the following morning. Neither child had any evidence of an acute infection of the nose or throat preceding or following the operation. Both

children had clinical and pathologic evidence of a marked chronic infection of the tonsils and adenoids, with partial destruction of the crypt walls.

In case 2 the fecal concretion probably added to the rapidity of the process, with the resultant fatal termination.

That the removal of the tonsils and adenoid may have been a factor in producing or inciting the appendicitis is possible, in view of the generally accepted opinion that appendicitis is frequently a result of acute or chronic tonsillitis.

ETIOLOGY OF ASTHMA

RELATION OF SINUS INFECTION TO ASTHMATIC ATTACKS *

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OMAHA

In reviewing the literature of the past three or four years on asthma, one of the outstanding facts is the swing of opinion back to the acceptance of the nose and nasal accessory sinuses as a contributing factor, if not the seat of the nervous reflex that causes the spasms called asthma.

In 1872, Voltolini [1] published a report of eleven cases of asthma with nasal polypi in which the patients were relieved by removal of the polypi. This experience has been repeated many times since Voltolini's report was made. I venture to say that every rhinologist has had that happy experience, and the question naturally arises, why can it not be repeated? For a time, beginning about thirty years ago, many rhinologists thought that all asthmas were secondary to some condition in the nose: polypi, hypertrophied turbinates, deviated septum, spurs, etc. This led to much unnecessary surgical intervention, which, in turn, failed to give the expected relief, and the medical profession condemned the practice. In the nineties asthma became recognized as an anaphylactic reaction, and since that time the allergic theory has been universally accepted. But many cases do not fall into a known allergic classification, nor are the patients benefited by specific treatment. So investigations have gone on to fill out the picture and to establish a basic cause and treatment for this class not properly allergic. In the meantime, Adam [2] of Glasgow and Haseltine [3] of Chicago have been working on the problem on the basis of autogenous toxins from infection and nasal irritation. Dixon and Brodie [4] have worked out the reflex arc, demonstrating that stimulation of the nasal mucosa causes a spasm of the muscles of the bronchi and claiming that this is the true basic

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* From the Department of Oto-Laryngology, University of Nebraska Medical College.

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1. Voltolini: Practitioner **123**:272 (Oct.) 1929; Die Anwendung der Galvanokaustic, ed. 2, Vienna, Wilhelm Braumüller, 1871-1872, pp. 246 and 312.

2. Adam: Glasglow Hosp. Rep., 1901.

3. Haseltine: M. J. & Rec. **130**:505 (Nov. 6) 1929.

4. Dixon, W. E., and Brodie, T. G.: J. Physiol. **29**:97, 1903.

phenomenon of asthma. Mullin,[5] in his epoch-making article, established the lymphatic course of drainage from the sinuses to the bronchial lymph glands and the effect of direct inspiration of purulent nasal secretion into the lungs. In 1927, McGinnis,[6] at the meeting of the American Medical Association in Washington, in a symposium on asthma, sturdily defended the infective basis for asthma, and advised careful surgical treatment for infection in the nasal sinuses followed by the administration of vaccines made from the material removed. He said: "The medical man who believes the causative factor to be protein absorption, from either the respiratory or the gastro-intestinal tracts, or food absorption, the surgeon who believes only in nasal surgery, and the physician who believes in the theory of deficient calcium content in the blood could all benefit by a consideration of all the possibilities."

In the discussion, the allergists and blood calciumists have the best of it. In sixteen discussions only five investigators mentioned nasal conditions and infections, and most of these did so only briefly. Dr. H. M. Davison[7] said, "I have never relieved a case of asthma complicated by sinus disease until the latter condition had first been relieved." Dr. J. Alexander Clarke, Jr.,[8] said, "I consider the sinuses of increasing importance, so much so that I now regard every infected sinus a potential source of asthma, etc." Clerf[9] said, "If treatment of the sinus infection relieves the asthma bronchoscopy is not indicated." The July, 1929, issue of the *Practitioner* is devoted to a symposium on asthma. The authors show a decided swing toward the opinion that nasal conditions and infections are the cause of asthma. Sir William Wilcox said, "An X-ray examination of the nasal sinuses should always be undertaken and the nasal sinuses submitted to expert rhinological examination." Sir James Dundas Grant, speaking of intranasal treatments, said, "My experience leads me to say that the physician who leaves it out of consideration . . . is not doing the best for his patient." Following this article, Van Leeuwen said that 90 per cent of all cases of asthma are allergic, and he claimed that 80 per cent of patients treated with allergen-proof chambers are free from asthmatic symptoms. Alexander Francis challenged Brodie and Dixon and said

5. Mullin, W. V.: The Relation of Paranasal Sinus Infection to Disease of the Lower Respiratory Tract, J. A. M. A. **87**:739 (Sept. 4) 1926.

6. McGinnis, Edwin: Asthma from the Standpoint of the Rhinologist, J. A. M. A. **89**:959 (Sept. 17) 1927.

7. Davison, H. M.: Tr. Sect. Laryngol. Otol. & Rhinol., A. M. A., 1927, p. 126.

8. Clarke, J. A., Jr.: Tr. Sect. Laryngol., Otol. & Rhinol., A. M. A., 1927, p. 129.

9. Clerf, L. H.: Tr. Sect. Laryngol., Otol. & Rhinol., A. M. A., 1927, p. 130.

that asthma is a paroxysmal neurosis and a symptom of vasodilatation of the bronchial vessels. The third symposium was published in the *Medical Journal and Record* of Nov. 6 and 20, 1929. Here one finds, as happened in treatises on focal infection, that the importance of rhinologic care in asthma is emphasized by the internist even more than by the rhinologist. Dr. George B. Lake said:

> Then came the allergic epoch. Someone discovered that paroxysms of asthma were especially common in persons who were subject to hay fever, urticaria, eczema and the various other symptoms associated with atrophy, and asthma then became a full fledged allergic disease, in which status it still, very largely, remains, for most physicians, even though no one yet has been able to tell us just what allergy is. . . . Under the best of circumstances, the orthodox views regarding asthma are so chaotic and, at times contradictory, and the results of treatment by the more or less standardized methods are so irregular, unpredictable and generally unsatisfactory, that only an almost fanatically enthusiastic allergist would maintain that we have reached the ne plus ultra in connection with this distressing malady.

Haseltine again restated his views that asthma is a toxic condition plus an irritation of the reflex arc which has its sensitive center in the nose. LaForce said, "Asthma can be cured in direct ratio to the completeness and permanency with which two things can be accomplished; correct all causes of abnormal toxic absorption and retention, and remove all causes of abnormal irritation to the spasm inciting mechanism of the respiratory tract." The specific inciting cause is usually disease of the nasal or accessory sinuses.

I have given this summary to present a picture of the rhinologist's place in the most recent literature. I have purposely not quoted much from the allergists' papers, because for years so much has been said and printed by them that further elucidation would seem superfluous. In 1870, Voltolini discovered that the removal of nasal polypi relieved certain patients with asthma. Adam, in 1907, stated that asthma resulted from two factors: general systemic toxemia or a lesion in the upper respiratory tract, generally in the nose. About the same time, Haseltine independently advocated the same fact with some refinements. Dixon and Brodie proved experimentally that asthma is a spasm of the bronchial muscles, and that this spasm is a reflex incited by irritation of the mucous membrane of the nose.

Logical as the explanation of asthma either by allergy or by toxicosis plus nasal irritations may be, it does not seem that either factor can be wholly right or wholly wrong. As the former does not explain the relief following the removal of pathologic processes in a grossly pathologic nose, neither does the latter explain the phenomena of an asthmatic attack following exposure to feathers, horse-hair, etc., in a person with a normal nose, according to rhinologic examination, or following the injection of a small amount of buckwheat, barley, etc.,

when the nose could not be irritated by external emanation. Hence I feel that there must still be two classes of asthma, that due to allergy and that due to toxicosis and nasal infection. I shall speak of the latter. It is evident that it takes more than simple nasal irritation and infection to cause asthma. This added factor is probably toxemia secondary to infection. Given a patient with a chronic infection of the nasal sinus who has become sensitive to the toxemia of the infection, and the asthma will continue as long as there is sufficient toxic material to overcome his inhibitors or natural immunity; therefore, certain patients are improved by removal of polypi and drainage of the sinuses. The extent of this improvement depends on two main factors: the amount of resistance the patient has and the extent of the pathologic changes in the sinuses. The type of case I am reporting is that of a patient with well established asthma, with severe chronic infection of the nasal sinuses and usually with polypi. Beginning several years ago with conservative nasal surgical intervention, I had about the usual success; that is, with the removal of the polypi and intranasal drainage of the sinuses, there was immediate relief for some weeks or months and at times a complete cessation of the attacks; in other cases, the patients remained sufficiently comfortable so that no more surgical intervention was undertaken. In the vast majority of cases, however, only temporary relief followed, and the patients returned for more treatment. Usually more polypi were found, and the drainage from the frontal or antral sinuses was obstructed, so that presently I found it necessary to perform radical operations on one or more sinuses, and with more complete operations, I found greater relief afforded. About this time, Dr. Lynch and others advocated as complete removal of pathologic tissue as possible from all old chronic sinuses. I decided to apply this technic to asthmatic patients with the same conditions. The results have been satisfactory. Many of the patients were in such poor condition that it was possible at first only to remove the polypi and wait until the patients were improved, as they all were, and then systematically to do a radical operation on all the sinuses which showed evidence of chronic infection. All this work has been done in close cooperation with an able internist, who carefully checked the cases before operative procedures were begun, and who was responsible for the medical care at all times. This cooperation is important, as the reaction from the operation and during the operation is often severe, and only the greatest care will prevent a tragedy.

My usual procedure is to hospitalize such patients and keep them until the surgical work is finished. In some cases an autogenous vaccine has been used, but with improved technic in operation, this has been less necessary. I have not found that the unpleasant postoperative

sequela, in the way of crusting, develops. The septum soon loses its boggy swelling and the polypi seldom recur. In all, about twenty-five patients have been treated in this way, and in only the most recent cases have the patients been kept in the hospital until all surgical intervention was finished. No fatalities have resulted.

Case 1 is typical of my early cases.

REPORT OF CASES

CASE 1.—When seen on Oct. 11, 1926, R. O. C. had had asthma for the past three months. He was unable to work and was poorly nourished; his breathing was labored, of the thoracic type. There were no gross pathologic changes in the right nares; there was some purulent secretion in the left nares; a large polypus was present in front of the middle turbinate. A roentgenogram showed: The right accessory sinuses were fairly clear; the left maxillary and ethmoid sinuses were shaded. At operation, the polypi and anterior ethmoid were removed. Window drainage of the left maxillary sinus was established. Following this the asthma was much less severe. The patient had some trouble at night. He continued in this way for two years; he then became much worse, and returned for assistance. He showed definite evidence of infection of both ethmoids and the right frontal sinus, and he had some polypi in the left middle fossa. I did a bilateral middle turbinectomy and ethmoidotomy, and made a free intranasal opening into the right frontal sinus. Following this procedure, the patient was fairly comfortable but was never able to work. One year later, he returned again with labored breathing and showing emaciation; the asthma was severe. His nose looked clean, except for pus coming from the right frontal sinus. There were two polypi. The nasofrontal duct was freely open. A roentgenogram showed all the sinuses clear, except the right frontal. A radical operation was performed on the right frontal sinus. The sinus was found full of thick, sticky secretion, and the mucosa was thick and tough like leather. The asthma cleared up almost at once and has not returned.

CASE 2.—J. K., aged 55, when seen on July 7, 1922, had had asthma for several years; it had been severe for several months. The patient was very thin; he could not work. There was milky-looking pus in both nostrils. The clinical and roentgenologic diagnosis was pansinusitis. Middle turbinectomy, ethmoidotomy and bilateral intranasal drainage of all the sinuses were performed. The sinuses all contained pus; the ethmoidal bone was necrotic. The asthma was much better. On Feb. 19, 1923, the asthma was worse. There was some purulent secretion in both nares. A culture was taken, and autogenous vaccine was administered. The patient improved after taking the vaccine. On October 11, the nose was quite clean and there was a little purulent secretion from the right sphenoid. The asthma was slight. On Aug. 25, 1926, the asthma was worse, and the patient coughed. There was purulent secretion in both nares. Another culture was taken, and vaccine was again administered. This and local nasal treatment again brought relief. Since then he has been fairly comfortable most of the time, but has never been entirely free from asthma.

CASE 3.—On April 2, 1928, A. H., aged 47, had an asthmatic cough. He had not been able to work for about two years. There were small polypi in the right nares, and a polypoid enlargement of the left middle turbinate. In the roentgenogram, the ethmoids and antrums revealed marked evidence of a thickened mucous

membrane. At operation, removal of the polypi, middle turbinectomy and window drainage of the antrums were carried out. The patient was relieved from cough, and the asthma was less severe; the patient did not require epinephrine. On Aug. 27, 1929, the asthma was severe. The patient required several treatments with epinephrine daily. A radical bilateral operation was performed on the antrum and ethmoid. Relief from asthma was prompt and complete. The patient has not returned since.

CASE 4.—On May 8, 1929, Mrs. M. F., aged 25, had a severe case of asthma. She required four or five hypodermic injections of epinephrine every night. The patient was a physical wreck. She had had two intranasal operations for polypi the previous September. She was the third patient from the same small village to apply for treatment for asthma within the past year. There were no polypi in either nares. Some purulent secretion was present. A roentgenogram showed all the sinuses to be very dense. A radical bilateral operation was performed on the maxillary sinuses. The sinuses were almost entirely filled with polypoid tissue. The patient was much relieved, but the asthma had not disappeared. She was allowed to go home, and it was hoped that the general condition would be built up. She still required epinephrine on some nights. On August 17, she returned to the hospital. Asthma was still present, but was not as severe as when the patient was first seen. The general condition was much improved. Radical operation, done at intervals of about a week, was performed on the ethmoids, sphenoids and frontal sinuses. This procedure completely relieved the patient from the asthmatic attacks; her breathing became practically normal, and she remained free from attacks. She is well and does her own housework.

CASE 5.—Mrs. D. P., aged 23, contracted asthma in 1926, while in Idaho, at an altitude of about 7,000 feet. The physician there prescribed a diet of orange juice, without relief. She later left Idaho, and on July 25, 1929, consulted Dr. Dunn. The asthma was very severe, and the patient required several hypodermic injections of epinephrine daily. A careful examination revealed no evidence of an allergic reaction. On nasal examination, a marked purulent infection was evident in both nares; polypi were seen in the left nares. A roentgenogram showed a marked shading over the right antrum and all the sinuses of the left side. On August 23, a radical operation was performed on the left antrum and ethmoid. A free intranasal opening was made into the frontal sinus; middle turbinectomy was performed on the left side. The antrum was completely filled with polypi and thick, foul-smelling pus. On September 12, a radical operation was performed on the right maxillary sinus. It was filled with polypi and a moderate amount of mucopurulent secretion. The patient was completely relieved from the asthma. The lungs have cleared up, and she has remained free from any recurrence up to the time this article was written.

SUMMARY

This series of cases serves to illustrate the point I wish to make, that asthma secondary to nasal infection requires for relief the same complete removal of infection in the nose and nasal accessory sinuses as has been so ably advocated by the leaders of the medical profession for diseases due to focal infections.

THE DIAGNOSIS OF VASOMOTOR DISTURBANCES OF THE NOSE

ROUTINE EXAMINATION OF THE NASAL FLUID FOR THE PRESENCE OR ABSENCE OF PUS CELLS *

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In reading the literature dealing with vasomotor disturbances of the nose, one is met at the outset with the confusion brought about by an unsatisfactory nomenclature. Many articles under various headings, such as vasomotor rhinitis, perennial hay-fever, paroxysmal rhinorrhea, paroxysmal rhinitis, hyperesthetic rhinitis, atopic rhinitis, etc., only tend to cause perplexity. They postulate causes that are not constant in all cases. The subject matter will be clarified if one keeps in mind the physiologic mechanism involved in all cases of vasomotor disturbances of the nose. It is known that these disturbances are brought about by an irritant that reflexly stimulates certain nerves within the nose.[1] The resulting reaction is an outpouring of a clear, watery discharge with or without sneezing, and is designed to remove the irritant. This reaction may be so slight that no attention is paid to it, and it is considered normal. In certain persons of a neuropathic disposition, inherited or acquired, it may become violent and uncontrollable. A large amount of watery nasal discharge is poured out, and paroxysmal attacks of sneezing occur. These attacks may be considered as an exaggeration of a normal reaction in a hypersensitive person and not necessarily caused by an infection or inflammatory process. The essential feature of this reaction is its regular, periodic "make and break." The intervals between the attacks may be weeks, days, hours or even shorter periods, but the periodic phenomena stamp them as being due to an irritation of the sympathetic nervous system, as it is characteristic of this system and all organs that it controls that they function with regular automatic periodicity.

From the rhinologic point of view, the most important point to determine in these vasomotor disturbances of the nose is: "Is this a purely vasomotor disturbance, i. e., a disordered phase of function, or

* Submitted for publication, March 18, 1930.

* Read before the Section of Rhinology and Laryngology, New York Academy of Medicine, Dec. 20, 1929.

1. Hubert, L.: A Study of the Mechanism of Rhinorrhea and Sneezing, Ann. Otol. Rhin. & Laryng. **33**:824, 1924.

an underlying pathologic condition, i. e., a latent nasal sinusitis with symptoms and signs similar to or like a purely vasomotor disturbance?" This is not only of academic interest, but essential in the successful management of these cases, as will be pointed out later.

The method that I have employed to answer the question has been carried out in many hundreds of cases at the Manhattan Eye, Ear and Throat Hospital, in the clinic of Dr. McCullagh and in private practice. It consists in the determination of the absence or presence of pus cells in the collected nasal fluid. If pus is present I can at once exclude a purely vasomotor disturbance, as pus is the product of an inflammatory process. I do not depend on the patients' statements whether or not the discharge is watery and clear, as their observations are often erroneous. The nasal fluid is collected in a test tube during a paroxysmal attack. It may be perfectly clear and is then considered free from pus. I do not look for occasional leukocytes, which are frequently present in all such fluids on account of the irritating effect of the exciting agent on the nasal mucous membrane. When the fluid is turbid, it is centrifugated and examined microscopically. In a considerable number of patients a moderate or large amount of pus cells is found. These patients, if carefully examined, will show evidence of nasal disease even in the interval between the attacks. Small polypi or a polypoid degeneration of the middle turbinates may be found. I have never observed free pus in the nasal cavity. The nasal mucous membrane is often pale, grayish and edematous, and it is this peculiar color that suggests the diagnosis of a vasomotor disturbance. The real nature of this disturbance is obscured by a latent and enclosed sinusitis. That this observation is probably correct can also be shown by testing the nasal fluid. On two or even three occasions it may be perfectly clear and at a subsequent examination it may contain a considerable number of pus cells. It is therefore necessary to repeat the test several times when a latent type of sinusitis is suspected. The trickling down of the irritating discharge at certain times makes the already sensitive nasal mucous membrane hypersensitive and evokes the paroxysmal attack. That this discharge is very irritating is shown by the fact that in some patients the vestibule of the nose and the upper lip become excoriated. This condition I have never observed in a purely vasomotor disturbance.

According to the test described, I have classified these patients into two groups: 1. Those with a purely vasomotor disturbance, without pus cells in the nasal fluid on repeated examinations, with a return of the nasal mucous membrane to its normal appearance after the attack is over and with nasal obstruction present only during a paroxysm. The treatment in these cases is not intranasal, but general, and is satisfactory in a large proportion of cases, as pointed out in an earlier communica-

tion.[1] 2. Those with a latent sinusitis, with pus cells in the nasal secretion after the first or subsequent examination, with some evidence of nasal disease, with more or less continuous nasal obstruction; the response to treatment is unsatisfactory unless the seat of the obscure and latent sinusitis is demonstrated by a good roentgenogram and is eradicated. In these cases the treatment is primarily intranasal and secondarily general. The diagnostic test outlined, therefore, produces a practical classification, as by the assignment of each case to its group, it at once points to the kind of treatment needed.

In some clinics the cutaneous tests are extolled as being the most important aid in the diagnosis of vasomotor disturbances of the nose. Except for hay-fever, I have been impressed with the futility of these tests in the majority of cases under discussion. Not more than 5 per cent of my cases have shown positive skin reactions.

SUMMARY

My purpose in this paper is to call attention to the diagnostic value of a simple, efficient and easy test, which has been carried out as a routine in many hundreds of patients suffering from vasomotor disturbances of the nose. It consists in the determination of the presence or absence of pus cells in the collected nasal fluid. According to this test, the patients are divided into two groups: (1) those without pus cells in the nasal fluid, who are suffering from a pure vasomotor disturbance, and (2) those with pus cells, who are suffering from a vasomotor disturbance, accompanied by a latent sinusitis. The test described not only is a time saver in arriving at a proper diagnosis and in instituting the right treatment, but also has an economic value. When pus cells are found, the next procedure should be to make roentgenograms of the nasal sinuses and not to waste time and money on the cutaneous tests. If the nasal fluid appears clear on several examinations, cutaneous tests are in order. The testing of the nasal fluid, therefore, gives at once a clue how to proceed to study and to treat these patients efficiently.

161 East Seventy-Ninth Street.

Clinical Notes

MELANOSARCOMA ORIGINATING IN THE MUCOUS MEMBRANE OF THE LOWER TURBINATE*

WILLIAM F. CLEVENGER, M.D., AND HOWARD L. NORRIS, M.D., INDIANAPOLIS

Melanosarcoma is well known, in general, to have its origin in pigmented tissue such as the choroid of the eye or the skin. The former is an especially favorable site for this form of lesion, it being more often found in the orbital region than elsewhere. The following case report is of interest as the mucous membrane of the lower turbinate, which is covered with ciliated columnar epithelium, does not contain pigmented tissue in its normal state.

REPORT OF CASE

History.—Mrs. A. S., aged 67, complained of nasal occlusion affecting the left side of the nose, of three months' duration, with complete obliteration for the past six weeks. A tumor mass protruded well into the left vestibule of the nose; there was frequent profuse nasal hemorrhage; no pain or discomfort was present. The family history revealed nothing of importance.

Examination.—Externally the nose was normal. There was no involvement of the glands of the neck or other lymphatics. A large tumor mass completely filled the left nasal passageway; it was movable, blackish red and vascular. The nasal sinuses were clear on transillumination. The nasopharynx, pharynx, faucial, glosso-epiglottic and laryngeal regions were normal. The tumor mass was shown to have its origin in the mucous membrane of the anterior end of the lower turbinate; it was attached by a small pedicle. No clinical diagnosis was made. The growth was removed on Oct. 8, 1929, at the Methodist Hospital, Indianapolis.

Laboratory Observations.—The report from Dr. Banks of the Methodist Hospital laboratory, in substance, was as follows: The gross specimen consisted of a mass of black friable material, which was encapsulated in one or two portions by reticulation that ran irregularly throughout the substance. One surface of the mass appeared shaggy, as though detached from a portion of its structure. On cross-section, it was homogeneous, infiltrated and black, with delicate, pearly gray recticulum running irregularly throughout suggestive of a fan-shaped arrangement from the deeper to the superficial surface.

Microscopic Examination.—The histologic picture showed an extremely irregular type of growth composed of polygonal and spindle cells, seemingly derived from the connective tissue. These cells were shown growing in wild profusion and in bizarre arrangement. Within their protoplasm and in the intercellular spaces, the cells showed deposits of a brown pigment, profuse in its occurrence. The cells composing the tumor growth were extremely irregular in size and shape, and their nuclei were variable in these respects. There was marked

* Submitted for publication, Jan. 3, 1930.

* Read before the Indiana Academy of Ophthalmology and Oto-Laryngology, French Lick Springs, Ind., Dec. 11, 1929.

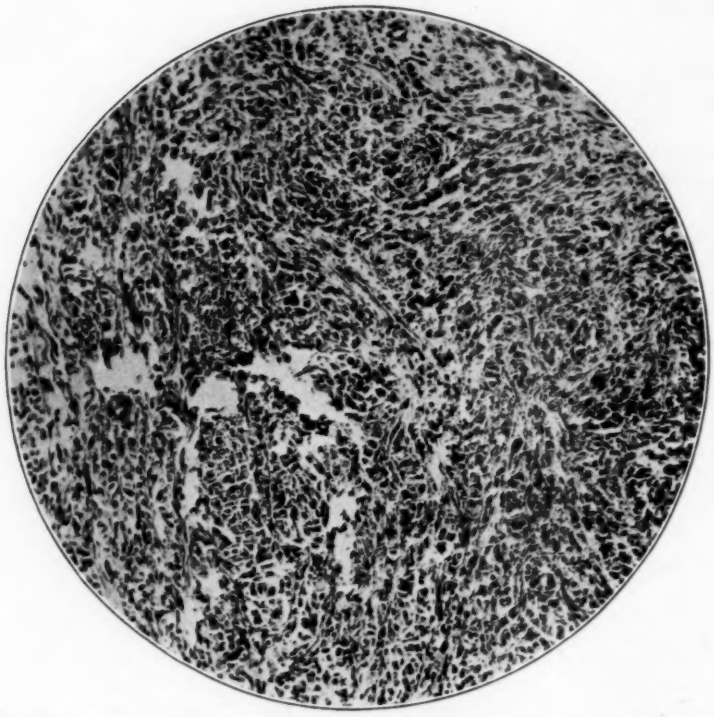

Fig. 1.—General pattern of growth. The variation of size and shape of the tumor cell is characteristically demonstrated; × 100.

Fig. 2.—Extracellular deposits of melanin. The irregular architecture of the tumor, as well as the irregularity of the tumor cell composing the growth, is demonstrated; × 75.

variation in the arrangement of the chromatin material of the nuclear structure of these cells, the solid compact type of nucleus being seen, but the majority of the nuclear structures showed bizarre arrangements in the open, loose and reticulated chromatin material. Atypical mitotic figures were extremely abundant. This type of cell is of rapid growth and decidedly malignant.

Diagnosis.—The diagnosis was melanotic sarcoma.

COMMENT

The features of interest in this report are the origin and the site of the lesion. No instance of melanosarcoma originating from ciliated columnar epithe-

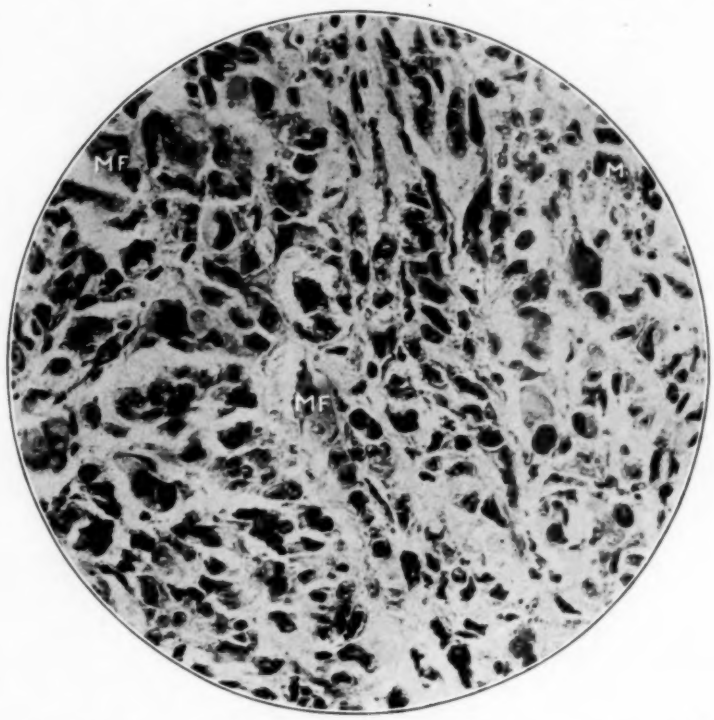

Fig. 3.—This illustration demonstrates the extreme variation in morphology of the tumor and also the striking similarity of the cells. Note the dark granulation of protoplasm which localizes the melanin (*M*). Irregular mitotic figures (*M.F.*) are easily identified as such; ×250.

lium has been reported so far as we have been able to ascertain. All authorities agree that this rapidly growing, rapidly metastasizing growth has its origin in pigmented tissue such as the choroid of the eye or the skin. There is no demonstrable evidence of unusual pigmentation of the region of the eye or of any part of the skin. The duration of this disease, as a rule, is brief and well known to be fatal, death usually occurring from metastatic involvement of the liver or other parts of the body.

AN UNUSUALLY LARGE ANTRAL POLYP*

JOHN J. SHEA, M.D., MEMPHIS, TENN.

In these days of modern rhinology, one does not expect to see the pathologic curiosities of a century ago. A youth, living in the St. Francis basin, was brought to see a physician for relief from a fleshy mass that was choking him. The history of the case was as follows:

S. J., aged 17, while vomiting became strangled by a fleshy mass which appeared in his mouth. The patient was unaware of the presence of any growth in his pharynx, though breathing through the left naris had been difficult at times during the past year.

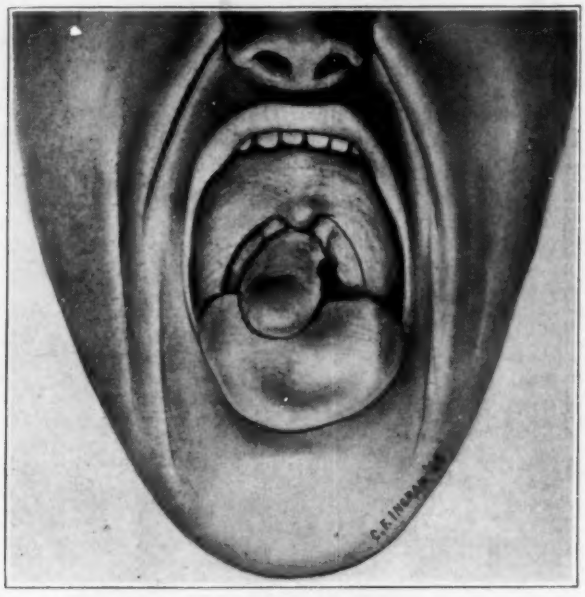

Fig. 1.—Drawing of tumor in situ.

Examination revealed a bruised and ulcerated mass, half the size of the tongue, lying on the dorsum of the tongue. The attachment could easily be traced into the nasopharynx and through the left choana into the left naris.

A roentgenogram showed the left antrum to be cloudy.

Operation.—A transantral approach was made, and the antrum was found to be filled with the same tumor mass, the attachment of which was at about the margin of the ostium. The tumor was severed as it emerged from the ostium and removed in two pieces, one being that which was formerly within the antrum and the other the portion that occupied the nose and hung down into the throat. The youth made an uneventful recovery, and on examination a year later failed to show any signs of a recurrence.

* Submitted for publication, Jan. 31, 1930.

Fig. 2.—Photomicrograph, showing an acute inflammatory edema of a polyp.

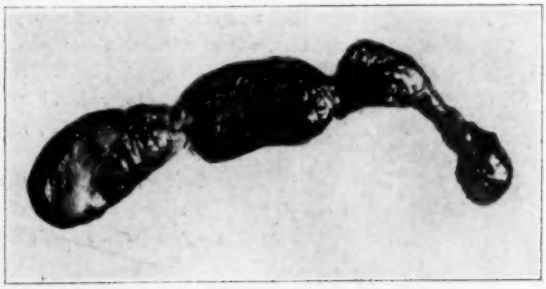

Fig. 3.—Tumor after removal.

Pathologic Report.—Gross Examination: The specimen consisted of four irregular masses of tissue, all of which were covered by a grayish, shiny membrane slightly mottled by areas of hemorrhage. It was of soft consistency.

Microscopic Examination: The section showed markedly edematous, infected, loose areolar connective tissue. Along one border were necrosis and bacterial colonies. Another border showed hyperplastic stratified squamous epithelium. In between these borders were many infiltrating polynucleated blood cells and much fibrin. The adjacent blood vessels were hyperemic.

A diagnosis of nasal polypi was made. The tissue was markedly degenerated and infected.

TUBERCULOSIS PAPILLOMATOSA CUTIS OF THE EAR*

FRANK L. DENNIS, M.D., COLORADO SPRINGS, COLO.

Tuberculosis papillomatosa cutis is a variety of skin tuberculosis. As its name indicates, it is characterized by the outgrowth of papillary excrescences. There are five more or less distinct tuberculous skin lesions described, of which lupus is the most common; the remaining ones are tuberculosis ulcerosa (miliary tuberculosis of the skin), scrofuloderma, tuberculids and tuberculosis verrucosa. The last named has at least three subvarieties, of which the subject of this paper is one. Morrow[1] described a case in which the growth started from the nasal orifice and spread over almost the entire face. There is an excellent illustration of the lesion in his atlas.

The growth is a reddish, papillary mass, the papillae being prominent, and in color the lesion resembles a dull red raspberry. Often a secretion can be expressed from between the papillae. The growth is painless and sluggish, and spreads slowly.

The cause of the disease is the tubercle bacillus. It is practically never found in persons free from pulmonary tuberculosis, is more common in men and frequently arises on the back of the hand, owing to the reprehensible habit some tuberculous patients have of wiping their mouths with the back of the hand. It is said also to be rather frequent in coal miners.

The pathologic process is not essentially different from tubercle formation in other tissues. In lupus the tubercles are located deep within the corium, while in tuberculosis verrucosa they begin in the upper papillary layers, often in the papillae themselves. Papillary outgrowths appear early in the papillomatous form, but in lupus they do not occur until later, when ulceration has developed.

Combined general antituberculous and local treatment of the lesion is essential. Tuberculin, I believe, has not been satisfactory. Many local applications, both stimulating and destructive, including cauteries and electrolysis, have been recommended. Surgical measures have a limited field.

By far the best results have been obtained from phototherapy and roentgen therapy. Stelwagon has found the latter to be useful in many cases, whereas in others it seems to have little influence or only after considerable reaction has

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* Submitted for publication, Feb. 7, 1930.

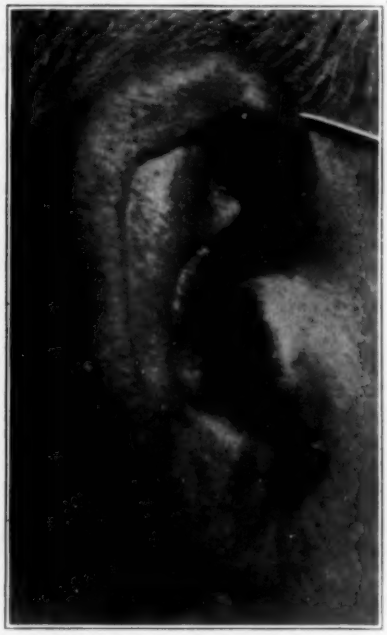
* Read at a Meeting of the Midwestern Section of the American Laryngological, Rhinological and Otological Society, Denver, Jan. 22, 1930.

1. Morrow: J. Cutan. & Genito-Urin. Dis. **6**:361, 1888; Atlas of Skin Diseases, 1889.

been produced. Ordinarily it is necessary to bring about a moderate and continuous reaction, interrupting the treatment at intervals of a few weeks so that the reaction may subside, and then resuming treatment if necessary. In the case I wish to present there were many previous tuberculous lesions, and the condition was, fortunately, not obstinate but yielded readily to roentgen therapy.

REPORT OF CASE

History.—A man, aged 27, consulted me on Nov. 17, 1927. The patient's history was furnished by Drs. Downing and Forney of the Woodman Sanatorium. The patient came to Colorado in May, 1923, and was admitted to Woodman Sanatorium. There was a history of cough, expectoration and night sweats. Tubercle bacilli were found in the sputum in August, 1922. He had far advanced pulmonary tuberculosis



Appearance of growth at beginning of treatment, Jan. 3, 1928.

complicated by tuberculous laryngitis, pharyngitis, bilateral otitis media purulenta and obstruction of the left nostril with purulent discharge. The tonsils were removed in 1922. A lesion on the shoulder appeared in January, 1924. He was an inmate of the sanatorium for about eighteen months. During this time, only 1 of 160 examinations of the sputum was positive for tubercle bacilli. The nasal lesion was stationary for several months. Sections of granulation tissue from the nose did not show tubercles. Smears from the nose and from the lesion on the shoulder did not show tubercle bacilli.

The patient was treated locally with water-cooled quartz light daily, at times with severe reactions. Later an air-cooled lamp was used. General irradiation with an air-cooled lamp and heliotherapy were used also. In 1924, roentgen irradiation of the pharynx, nose, external ears and mastoids was done. The dosage was

98 kilowatts, 2½ milliamperes, 16 inch distance through 1 mm. aluminum filter for five minutes.

The chief complaint when he consulted me was deafness, discharge from the right ear and a growth from the meatus of the right ear down on to the cheek. He said that the condition of the lung was greatly improved, and that his voice was good; the throat was not sore.

Examination.—The nose was normal, except for some scarring and loss of tissue of the anterior nares. The soft palate was distorted by scarring; the uvula had been amputated. The tonsils were absent. The epiglottis had been almost completely destroyed but was healed with much scarring. The left external ear was normal; the drum membrane was bound down by adhesions. The meatus of the right ear was filled with a papillomatous, pink growth which bled easily. The growth extended downward on the cheek. The drum membrane had a large perforation and was discharging a small quantity.

No other treatment than roentgen irradition and cleansing of the right external meatus was used. The patient received ten treatments at intervals of two weeks beginning Jan. 3, 1928. The dosage was 0.5 skin unit, 45 kilowatts, 3 milliamperes, no filter, 17 inch distance for two minutes.

On June 9, 1928, the growth had disappeared, except one single papilla which was clipped off with scissors. The discharge from the middle ear had stopped. There was no change in the deafness.

The patient was seen on Oct. 29, 1929. There was no sign of trouble in the right external ear; the skin was smooth and the middle ear was dry. There was no change in the hearing.

COMMENT

This is a case of combined pulmonary laryngeal and otitic tuberculosis, together with lupoid or verrucous lesions of the skin and mucous membrane. My opinion is that the disease in the left nasal cavity and pharynx was lupus instead of the usual secondary tuberculous ulceration which is seen in advanced pulmonary disease. The skin lesion in the right external meatus was probably a direct infection from the discharging ear, as it followed the exact course that such a discharge would take. The diagnosis was made from the history and the characteristic appearance of the growth. The patient's general condition is now fairly good, and he is able to do light work.

Drs. Downing and Forney reported this case at the 1924 meeting of the Colorado State Medical Society.

301 Ferguson Building.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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THE PARANASAL CAVITIES

A REVIEW OF THE LITERATURE FROM OCT. 1, 1928, TO OCT. 1, 1929

D. CAMPBELL SMYTH, M.D.

BOSTON

The volume of literature on the sinuses during the past year is as usual abundant and also as usual contains little that is new. There may be some excuse for men in the small towns in remote sections of the country writing papers containing well known facts, but there can be no excuse for well known otolaryngologists looked up to by the medical profession continuing to write year after year papers that contain nothing that cannot be found in the most dust-covered textbooks on otolaryngology on the library shelves. The natural inference is that these men have told all that they know, but wish to continue to write.

The maxillary sinus, probably because, as Mosher once said, it is near the surface and hence easy to get at, is the one about which the most is written. Certainly this is not due to the fact that trained otolaryngologists should be in any disagreement as to the methods of diagnosis or the proper treatment in diseases of this sinus, for the operative treatment in each case should be well defined in the minds of all well trained otolaryngologists. It seems to me that there are only two questions concerning the maxillary antrum about which men might logically differ. One of these is the question of using opaque oils as an aid in diagnosis, and the other is whether it is advisable or not to remove all of the lining, diseased and normal, during operation. I feel that these two questions are not settled as yet.

What I should like to see is more articles on the histology and pathology of the nasal mucous membranes, a practically virgin field. Articles that would add anything to the treatment for osteomyelitis above the orbit would also be of great value.

ANATOMY AND PHYSIOLOGY

In a symposium on the ethmoid, before the American Academy of Ophthalmology and Otolaryngology, Mosher [1] presented a review of the surgical anatomy of the ethmoidal labyrinth. The article is well illustrated with drawings by the author, and at the conclusion it contains a quiz on the ethmoid which is so full of useful working knowledge that I am quoting it in full.

Quiz on the Ethmoid

Q.—How much of the lateral wall of the nose is made by the ethmoidal labyrinth?

A.—The upper half. The lower half is made by the nasal wall or the base of the antrum.

Q.—How much fluid will the ethmoidal labyrinth hold?

A.—From 8 to 10 cc.—3 drachms.

Q.—What is the shape of the labyrinth?

A.—Pyramidal—wider behind than in front—wider above than below.

Q.—What is the width of the labyrinth anteriorly?

A.—From 0.5 to 1 cm.

Q.—What is the width posteriorly?

A.—1.5 cm.

Q.—What is the anteroposterior length of the labyrinth?

A.—From 3 to 4 cm.

Q.—What is the height of the labyrinth?

A.—From 2 to 2.5 cm.

Q.—What part of the labyrinth is most accessible from the nose?

A.—The agger nasi cell is present—otherwise the ethmoidal bulla.

Q.—Does the cribriform plate make the roof of the ethmoidal labyrinth?

A.—No, a prolongation of the orbital plate of the frontal makes the roof of the ethmoidal labyrinth.

Q.—What does the cribriform plate make the roof of?

A.—The olfactory slit. The ethmoidal cells are present on the 7th month of fetal life. There is no uniform development. One ethmoidal labyrinth may be larger than the other. The cells empty into the meatus from which they spring. The cells are bottle shaped. The bases of the cells are on the os planum and the lacrimal bone. Many cells reach the base of the skull. The cells vary from 3 to 15. Operations have been done on the labyrinth as early as 3 years. (Meyer.)

Q.—What anatomic structure divides the anterior from the posterior ethmoidal cells?

A.—The basal lamella or the attachment of the middle turbinate. The anterior ethmoidal foramen is at the upper end of the attachment of the basal lamella of the middle turbinate.

Q.—What forms the outer or the orbital wall of the anterior ethmoidal cells?

A.—The lacrimal bone. Therefore in approaching the anterior ethmoidal cells from the orbit you approach them through the lacrimal bone.

Q.—What forms the outer or the orbital wall of the posterior ethmoidal cells?

A.—The os planum.

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1. Mosher, H. P.: Surgical Anatomy of the Ethmoidal Labyrinth, Tr. Am. Acad. Ophth. & Otolaryng., 1929.

Q.—What forms the inner or nasal wall of the anterior half of the ethmoidal labyrinth?

A.—The inner walls of the anterior ethmoidal cells. That is, the agger nasi cell—the lacrimal cell—the infundibular cells—the cells of the ethmoidal bulla. All of these cells are overlain by the upper anterior part of the middle turbinate.

Q.—What forms the inner wall of the posterior ethmoidal cells?

A.—The superior turbinate—the third and fourth turbinates.

Q.—What is the posterior limit of the labyrinth?

A.—The outer half of the front face of the corresponding sphenoidal sinus.

Q.—What is the upper anterior limit of the labyrinth?

A.—The posterior surface of the ascending process of the superior maxilla.

Q.—What is the lower anterior limit of the labyrinth?

A.—The ethmoidal bulla.

Q.—What are the most important relationships of the anterior ethmoidal cells?

A.—With the lacrimal bone—the floor of the frontal sinus—the hiatus semilunaris or unciform groove and through this with the nasofrontal duct and ostium of the antrum.

Q.—What are the most important relationships of the posterior ethmoidal cells?

A.—With the outer half of the front wall of the corresponding sphenoidal sinus—with the posterior half of the inner wall of the orbit—with the optic nerve.

Q.—What is the thickness of bone between the optic nerve and the most posterior of the ethmoidal cells?

A.—From 0.5 to 5 mm. The nerve may mound into the cell.

Q.—What are the most common extensions of the anterior ethmoidal cells?

A.—Anteriorly to the inside of the ascending process of the superior maxilla making the agger nasi cell—upward into the frontal sinus, making a frontal bulla—the extension upward and outward of the superior cell of the ethmoidal bulla marking a cell in series with the frontal sinus—the fronto-ethmoidal cell. The ethmoidal cells are continually getting out of bounds.

Q.—What are the most common extensions of the posterior ethmoidal cells?

A.—Backward over the sphenoidal sinus—backward to the side of the sphenoidal sinus. Rarely downward into the antrum making the so-called double antrum. Into the middle turbinate making a cystic turbinate.

Dehiscences of the walls of the labyrinth.

The books state that dehiscences are not infrequent in the os planum.

The lacrimal bone is normally oribriform with small dehiscences.

The Blood Supply

The ophthalmic artery from the internal carotid. The anterior and posterior ethmoidal arteries. The spheno-palatine artery from the internal maxillary.

Nerve Supply

Meckel's ganglion—the nasal branch of the ophthalmic.

Veins

Connect with the facial—the inferior ophthalmic and cavernous sinus—the pterygoid plexus and so with the cavernous sinus—with the pharyngeal veins.

Lymphatics

Connect with the lymphatics of the cranial cavity especially by way of the sheaths of the olfactory nerves. They drain chiefly into the gland in the pharyngo-maxillary fossa which is placed on the body of the second vertebra—the gland which suppurates in retropharyngeal abscess.

The Nasofrontal Duct

Q. When is a nasofrontal duct not a duct?

A.—Usually there is no duct. In most cases the unciform groove ends blindly or in an ethmoidal cell.

Q.—What is the best method of reaching the opening of the duct into the frontal sinus?

A.—The approach through the agger nasi cell or, if this is not present, through the upper anterior part of the middle turbinate.

Number of half heads dissected	20
Number of agger nasi cells found	8
Unciform groove continuous with the nasofrontal duct	3
Unciform groove ending blindly	17
Fronto-ethmoidal cell	1
Greatest number of anterior ethmoidal cells	5
Smallest number of anterior ethmoidal cells	2
Greatest number of posterior cells	3
Smallest number not recorded.	
Fourth meatus present in	5
Longest labyrinth	4 cm.
Shortest labyrinth	2.75 cm.
Posterior ethmoidal cell running back over the sphenoid	1
Posterior ethmoidal cell running backward and lateral to the sphenoid	4

PATHOLOGY AND BACTERIOLOGY

Knowlton [2] and McGregor [3] reported the results of their experiments on dogs, in which they removed the mucous membrane lining of the antrum in three animals. The dogs were killed at various intervals after the operation, and microscopic studies of the tissues of the antrum were made, showing the following results:

1. Anatomically and histologically, the dog's antrum is well adapted for experimental study.

2. One month after the lining of the antrum is removed, epithelial regeneration is well established, and formation of bone begins.

3. Three months afterward, epithelial regeneration is complete, and the canine fossa opening is nearly filled with bone.

4. Five months afterward regeneration of the glands is well established and the mucoperiosteum as a whole looks almost normal.

5. The linings of the human antrum thus far examined show that the same process occurs in man as is here shown in the dog.

McGregor,[3] in an article well illustrated with photomicrographs, reported his histologic study of cysts of the maxillary sinus. He stated that they may be simple or multiple and may vary greatly in size, at times filling the whole antrum. He concluded that they are infectious

2. Knowlton, C. D.: How and When Mucous Membrane of the Maxillary Sinus Degenerates: Experimental Study in Dog, Arch. Otolaryng. **8**:647 (Dec.) 1928.

3. McGregor, G. W.: Formation and Histologic Structure of Cysts of Maxillary Sinus, Arch. Otolaryng. **8**:506 (Nov.) 1928.

in origin and occur only in the presence of a pathologic process. He stated that the chief etiologic factor is damage to the cilia of the gland tubules by infection. Edema, infiltration and fibrosis may be contributing factors. Photomicrographs accompany the article showing pathologic changes that may take place in the lining epithelium of these secreting cysts. Dental cysts arise from epithelial rests which remain after the development of the teeth and which become stimulated to activity by infection. They may contain large cells known as clasmatocytes, which are derived from monocytes, that have great phagocytic powers. Possibly a tuberculous factor may be present. Mesothelial cysts occur in the edematous mucous membrane and are due to the accumulation of the tissue fluids in the tissue spaces. These cysts have not a truly formed wall. The edema is due to a disturbance of the water balancing mechanism caused by infection. These cysts are filled with tissue fluids while secreting cysts are filled with mucus. McGregor stated that any one of these cysts may harbor infection and act as a focus of infection.

Fetissof,[4] on the basis of histologic study, expressed the belief that the growth of osteomas takes place from the inside outward by the metaplasia of fibrous tissue into bone tissue. The osteoblastic ossificating process that takes place in the periphery of the osteoma plays a secondary rôle in the growth of the tumor. The fibrous tissue filling the interstices of spongiose bone is the direct continuation of the periosteum covering the osteoma from the outside. The theory of the origin of osteomas from the periosteum split off at the stage of the development of the organism of the periosteum is the most fundamental.

Israel[5] classified disease of the maxillary sinus into three groups based on the anatomic changes as follows:

(1) Exudative inflammation, or the form in which the fluid and cellular exudation from the blood vessels is the predominating element.

(2) Parenchymatous or degenerative inflammation, or the form in which destruction of the parenchyma cells is the leading feature.

(3) Productive inflammation, in which proliferation is the striking characteristic.

The nature of the case, as well as the resistance of the organism or the affected part, determines the character of the inflammation.

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4. Fetissof, A. G.: Pathogenesis of Osteomas of Nasal Accessory Sinuses, Ann. Otol. Rhin. & Laryng. **38**:404, 1929.

5. Israel, S.: Chronic Disease of the Maxillary Sinus: Diagnosis and Surgical Treatment, Arch. Otolaryng. **7**:565 (June) 1928.

Depending for its classification on the stage of inflammatory reaction present and bacteriologic invasion, the exudative group, the larger of the two, has many subdivisions, namely:

(1) Edematous or serous inflammation, characterized by a copious exudation of fluid from the blood vessels.

(2) Fibrinous inflammation.

(3) Pseudomembranous or adiphtheritic inflammation.

(4) Suppurative inflammation characterized by an unusual abundance of emigrated leukocytes and by a tendency to liquefaction.

(5) Hemorrhagic inflammation.

(6) Catarrhal or mucous inflammation. The term is used to designate inflammations of the mucous membranes. The character of the inflammation depends to a large extent on the individuality of the mucous membrane affected, differing greatly in the nose, throat, stomach, etc. The epithelial cells of the surface suffer degeneration (mucous or fatty) and necrosis, and are discharged, etc. In the nose, the discharge is frequently mucopurulent.

Israel's investigations revealed the fact that the classification into the types of disease of the sinus, namely, suppurative and catarrhal, is histologically incomplete, and that instead of being two types of inflammation these conditions are different stages of the same type of inflammation of the mucous membrane. Exudative inflammation may occur with a discharge of mucus or pus or of both, and to the former the term "catarrhal" is applied.

BENIGN TUMORS

Osteomas of the frontal sinus have been reported by Sackin,[6] Howarth,[7] Browder [8] and Rosenstein.[9] Browder [10] also reported a case of encephaloma occurring in an infant aged 11 months. It presented in the midline of the long axis of the external nose. Examination revealed a tumor about 1.5 cm. in diameter, rounded and firm. It could be raised away from the nasal bones, but was attached to the underlying structures in the upper part. A roentgenogram showed a small circular defect in the region of the glabella. The tumor was removed under local anesthesia, and a stalk was identified which led through the small circular opening shown in the roentgenogram. The bony opening was enlarged in order to visualize the course of the stalk, which was found

6. Sackin, D.: Osteoma of Nasal Accessory Sinuses, J. Ophth., Otol. & Laryng. **33**:47, 1929.

7. Howarth, W.: Large Osteoma Causing Mucocele of Frontal Sinus and Maxillary Antrum, J. Laryng. & Otol. **44**:390, 1929.

8. Browder, J.: Osteoma of Frontal Sinus, Arch. Otolaryng. **9**:297 (March) 1929.

9. Rosenstein: Operative Cure of Osteoma of Frontal Sinus, Ztschr. f. Laryng., Rhin. **18**:52, 1929.

10. Browder, J.: Ann. Otol. Rhin. & Laryng. **38**:395, 1929.

to divide into two parts, one attached to each frontal lobe. Both attachments were severed, and the tumor was removed. The child died several days later of pneumonia. This tumor is congenital and benign, and is not a new growth but anomalously placed brain tissue. It is sometimes called a glioma, but this is erroneous and misleading. There are three types—intranasal, extranasal and a combination of both. The intranasal, of course, produces symptoms of nasal obstruction. For this reason nasal obstruction in an infant should be carefully investigated before operative intervention is attempted. Histologically, the encephalomas are composed of embryonic type nerve cells, neurofibrils, and in some instances true nerve fibers.

Oberrender [11] reported a cyst of the ethmoidal frontal region which he believed to be syphilitic in origin. It had entirely eroded the left nasal bone, presenting under the skin as a bluish mass, and was found at operation to occupy the anterior and posterior ethmoidal region and also both frontal sinuses. In the ethmoidal region it had lost its cystic appearance and was more of tumor consistency. Pathologic examination of the tissue, although not conclusive, pointed to syphilis.

Paradzik [12] reported a case of chondroma of the ethmoid in a man 45 years of age. The case was reported six months after removal of the tumor, and at that time the man was well and seemed to be completely cured. Fifty-five such tumors of the sinuses have been reported in the literature.

Bourgeois [13] reported a case of osteoma of the frontal sinus causing exophthalmos. It could be seen in the region of the middle turbinate. The vision of the eye of the same side was lost following surgical removal of the tumor.

Zentner [14] reported a case of fold formation of the retina due to a large mucocele originating in the frontal sinus.

In addition to the typical picture of fold formation in the retina, there was a difference of 13 diopters in the horizontal and vertical meridians of the cornea.

Before operation, the papilla could not be seen, but the folds above the papilla could be made out. Four weeks after the radical removal of the mucocele, there was enophthalmos. The papilla was elevated 4 diopters and in the area where buckling of the retina and fold formation had been found earlier, there were to be seen parallel and horizontal

11. Oberrender, G. F.: Cyst of Left Ethmoidofrontal Region, Laryngoscope **39**:298, 1929.

12. Paradzik: Chondroma of Ethmoid, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:505, 1929.

13. Bourgeois, H.: Ann. d. mal de l'oreille, du larynx **47**:1131, 1928.

14. Zentner: Klin. Monatsbl. f. Augenh. **80**:208, 1928.

streaks. Later the cornea lost its old form and showed an astigmatism of only 4 diopters.

MALIGNANT DISEASE

Papers on malignant disease were published by Myerson,[15] Schreiner,[16] Paunel[17] and Aynesworth.[18] The general treatment used by these authors was removal of the tumor followed by irradiation. Diathermy for removing the tumor mass is still the choice of some, while others use straight dissection.

FRONTAL SINUS

Spencer[19] reported two illustrative cases in which a modified Lothrop operation was used. His completed operation differs from Lothrop's in that: (1) the opposite sinus is not opened; (2) the upper part of the septum is not removed; (3) the opening into the sinus is all above the bridge instead of below; (4) the burrs are used from above instead of from below. The author leaves one unconvinced of the efficacy of the procedure.

Duncan,[20] from his experience, came to the conclusion that frontal sinusitis is a complicated condition, and the physician who first takes into consideration the patient, makes a diagnosis in a careful manner and secures the establishment of adequate and permanent drainage gets the best results.

Lyman[21] reported a case of an unusual, large frontal sinus extending upward 9 cm. above the orbital ridge and outward and backward 4 cm. beyond the outer edge of the orbit, the approximate width of the sinuses being 10 cm. In spite of the fact that the Knapp-Barany-Lynch operation was selected for this type of case, the patient was well up to the time the article was written. For permanent cure in frontal sinusitis, however, I believe the proper type of operation must be selected for the individual case.

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15. Myerson, M. C.: Carcinoma of Orbit and Ethmoid Removed by Surgical Diathermy, Laryngoscope **39**:185, 1929.

16. Schreiner, B. F.: Five Year End-Results of Irradiation, Based on Study of Forty-Five Cases, Radiol. Rev. & Chicago M. Rec. **51**:281, 1929.

17. Paunel, M.: Rapid Invasion of Primary Sarcoma of Left Maxillary Sinus, Rev. san. mil., Bucuresti **27**:185, 1928.

18. Aynesworth, H. T.: Malignancy of Orbit and Accessory Sinuses, Texas State J. Med. **24**:354, 1928.

19. Spencer, F. R.: Conservative Modifications of Lothrop External Frontal Sinus Operation, Arch. Otolaryng. **9**:501 (May) 1929.

20. Duncan, R. A.: Chronic Frontal Sinusitis, Texas State J. Med. **29**:702, 1929.

21. Lyman, H. W.: Case of Gigantic Frontal Sinus Requiring External Operation, Ann. Otol. Rhin. & Laryng. **37**:1195, 1928.

Parrish [22] stressed what he calls "lead up" treatment before resorting to radical surgical measures on the frontal sinus. This "lead up" treatment consists of intranasal treatment instituted to improve drainage and aeration, also for cleaning up antral and ethmoidal infection.

Magnotti [23] experimented on various animals, producing an acute frontal sinusitis by introducing a virulent culture of staphylococcus. The animals were killed after periods of from one to two months. Marked changes were found in the olfactory bulb on the same side, the fibrillary and glomerular layers had been replaced by fibrous tissue, and the whole bulb showed signs of degeneration. The bulb of the opposite side showed areas of degeneration in the fibrillary and glomerular areas, but the rest of the bulb appeared normal. There were also degenerative changes in the macula lutea on the same side. Careful examination of the cortical center of smell failed to show any changes.

Skillern [24] regarded the modified Lothrop procedure as preferable, because it requires less operating time and anesthesia and produces less shock. Constant pressure on the orbit during the Killian operation may result in edema of the eyelids and danger to the optic nerve, while there is ever danger of injury to the lacrimal duct. He stated that there is less tendency to fistula formation; also, the operation leaves a small scar in the hair line and no disturbance in the eye.

ETHMOIDAL SINUS

Turnbull [25] advocated the transantral route of approach to the ethmoidal and sphenoidal sinuses. This method of approach was originally advised by Jansen. Turnbull claimed that by this method it is possible to drain the frontal and maxillary sinus without destroying the turbinate.

Weinstein [26] reported a case of hemiplegia with orbital edema in a child 10 years of age during the course of an attack of scarlet fever. The patient made a complete recovery following an exenteration of the right ethmoid cells, in which an acute purulent infection was present. The author believed that the ethmoid operation established sufficient drainage and ventilation to release intracranial lateral edema.

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22. Parrish, R. E.: Frontal Sinus Surgery with Case Reports, Laryngoscope **39**:187, 1929.

23. Magnotti, T.: Rôle of Olfactory Center (Circumvolutions of Ammon's Horn) in Modifications of Olfactory Bulb, Following Frontal Sinusitis, Arch. ital. di otol. **39**:671, 1928.

24. Skillern, S. R.: Advantages of Modified Lothrop Operation Over Killian Procedure in Chronic Frontal Sinusitis, Tr. Am. Acad. Ophth. **33**:372, 1928.

25. Turnbull, F. M.: Antro-Ethmosphenoidal Operation, Arch. Otolaryng. **9**:271 (March) 1929.

26. Weinstein, M. A.: Ethmoiditis Producing Hemiplegia, Concomitant with Toxic Scarlet Fever: Operation, Cure, Ann. Otol. Rhin. & Laryng. **38**:478, 1929.

Advocates of conservative ethmoidal surgery are Howarth,[27] Skillern [28] and Moore.[29]

Wheelihan [30] reported a case of spheno-ethmoiditis with fatal complications following influenza. Autopsy showed almost complete erosion of the body of the sphenoid. The ethmoidal labyrinth was in the same condition and was so friable that the bone would crumble to pieces at the slightest pressure made on it. Edema of the brain and orbital contents with congestion and clotting in the basal veins was evident. This patient had had a gradual decline with intermittent nasal discharge for one year following his attack of influenza.

MAXILLARY SINUS

Matheson,[31] in a paper on cysts of the mucous membrane of the maxillary sinus, reported 5 cases and stated that they are infrequent, only 8 cases having been discovered in the routine roentgen examination of 1,100 patients. This is an extraordinary statement as cysts of the antrum are found in about 15 per cent of the routine roentgen examinations of that sinus at the Massachusetts Eye and Ear Infirmary. There would be about 165 cysts in an equivalent number of roentgenograms. The author advocated and did a radical operation on the antrum in all his cases.

Mithoefer [32] called attention to the fact that latent disease of the antrum may easily be overlooked. He stressed the fact that the results of nasal operations will be better if a latent condition of the maxillary sinus is recognized and cleaned up when any other operation, such as one for better aeration, is being done.

Ersner [33] gave a summary of his analysis of 50 operative cases of maxillary infection.

> In analyzing fifty operative cases in which pathologic studies were made we found hypertrophied tissue, atrophy, polyps, granulation tissue and cysts. It is a curious observation that the streptococcus hemolyticus and streptococcus viridans predominated, and these organisms were more often found in the nonsuppurative maxillary sinusitis.

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27. Howarth, W.: Conservative and Surgical Treatment of Chronic Ethmoiditis, Eye, Ear, Nose & Throat Monthly **7**:559, 1928.

28. Skillern, R. H.: Chronic Ethmoiditis; Conservative Surgical Treatment, Eye, Ear, Nose & Throat Monthly **7**:539, 1928; South. M. J. **22**:108, 1929.

29. Moore, T. W.: Nasal Sinuses with Special Reference to Ethmoids, South. M. J. **22**:38, 1929.

30. Wheelihan, M.: Spheno-Ethmoiditis with Fatal Complications Following Influenza, M. J. Australia **2**:18, 1929.

31. Matheson, J. P.: Mucous Membrane Cysts of Maxillary Sinus, South. Med. & Surg. **91**:9, 1929.

32. Mithoefer, W.: Latent Disease of Maxillary Sinus, Laryngoscope **39**:29, 1929.

33. Ersner, M. S.: Diagnosis of Maxillary Infection, Ann. Otol. Rhin. & Laryng. **38**:87, 1929.

It is my practice to observe conservatism in the treatment of maxillary infection, especially when it is of the nonsuppurative type. In some of the asthmatic cases, although we found nasal polypi, we at no time were able to find pus on puncture of the antra. We found that about 80 per cent of nasal polypi were associated with maxillary infection and improved after operation.

In a group of cardiorenal cases antrum punctures were negative at various times. In some cases it was difficult to force air through the antrum, due to the edema of the antral mucous membrane, polyps, or polypoid tissue around the ostium or around the needle point orifice (the needle being patulous by test). Lipiodol in these cases definitely outlines the intramaxillary pathology.

In a group of diabetics with hyperglycemia we found that the blood sugar could not be reduced until the maxillary antra were operated on, thus removing the source of infection (Caldwell-Luc performed).

Ersner stated that nonsuppurative maxillary sinusitis has from a focal phase been sadly overlooked. Speaking of the problem of conservatism and operative intervention, he stated that from his microscopic study of specimens no conservative operation of the intranasal type performed on the maxillary sinus will obtain cure in a case with tissue changes after it has passed the stage of resolution. In view of the fact that he found hypertrophic, hyperplastic and atrophic granulation tissue, polyps and cysts in the study of his cases, he felt that the open canine fossa operation with complete inspection of the intramaxillary structures affords the best opportunity of eradicating diseased tissue.

Israel [5] came to the following conclusions in regard to treatment for maxillary sinusitis from a clinical standpoint:

In an infection of the maxillary sinus that has continued over a period of three months, sufficient changes have taken place to justify change in treatment and in prognosis.

A radical operation must be performed in order to remove completely all pathologic processes from a diseased maxillary sinus.

The roentgen ray offers valuable aid in the diagnosis of chronic disease of the maxillary sinus.

Exploratory puncture and irrigation for diagnosis is frequently misleading.

Local anesthesia is much to be preferred in operations of this character.

The Denker operation offers the most certain and reliable means of permanent relief, and should be the operation of choice.

Tonndorf,[34] from his investigations, reported as follows:

Ssamoylenko and Lange have made experiments on the frontal sinuses of animals in which the frontal sinuses were opened broadly from the anterior wall, and the mucous membrane and periosteum removed with sharp spoons until the osseous walls were laid bare. In order to be sure that the mucous membrane was completely destroyed, Ssamoylenko dried the field with hot air and painted it with concentrated tincture of iodine. The shallow cavities disappeared through development of newly formed osseous and connective tissue. The new

34. Tonndorf: Healing After Luc-Caldwell Operation on Maxillary Sinus, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:54, 1928.

formation emanated from the periosteum of the outer soft tissues, but in the region of the exposed bony walls from the endosteum, namely, from that connective tissue that covers all the small interspaces between the little bone trabeculae and which possesses bone-forming qualities just as the periosteum does. Lange had expressed the idea that the maxillary antrum of human beings also, after removal of the mucous membrane, could be made smaller by such endosteal connective tissue and new formation of bone. Histologic proof has not yet been furnished. The author possesses a specimen from a patient who was operated on for a bilateral chronic suppuration of the maxillary antrum and died four weeks later from abscesses of the liver. He gives a detailed account of the histologic observations, and thinks that the future healing process may be assumed with some probability. The epithelium probably will advance further into the cavity, not only from the borders of the opening made by the operation in the lower nasal meatus, until a complete covering is produced. The thick pillow of young endosteal granulation tissue will shrink when it changes into connective tissue, as is observed in the ear after a radical operation on the mastoid. Secondary operations on the maxillary antrum have shown a considerable new formation of bone which more or less obliterates the large opening. Emanating from the periosteum, pillows of connective tissue have been observed to protrude into the cavity like conical processes. All these new formations of bone and connective tissue lead to a decrease in the size of the maxillary antrum. Investigation of further stages must decide whether hereby the definite stage is reached or whether processes of involution may set in in this newly formed tissue.

On the basis of 236 histories and 379 maxillary sinuses on which operation had been performed, Tonndorf [35] arrived at the following conclusions:

The disease of the maxillary sinus is the most frequent among the chronic diseases of the accessory sinuses. It plays a similar part in the diseases of the upper respiratory tract as adenoids do in children. Persons about 20 years of age are especially afflicted. If disease of the maxillary antrum is eliminated, other slightly affected sinuses (ethmoid and frontal sinus) heal spontaneously. Diseases of the frontal sinus are far less frequent than disease of the maxillary sinus. Isolated diseases of the ethmoid or sphenoid are still lesss frequent. In a large percentage of cases, a bilateral disease of the maxillary sinus is present. In an apparently unilateral disease, an exploratory irrigation of the other side is necessary in order to reach a safe conclusion.

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35. Tonndorf: Frequency of Chronic Bilateral Maxillary Inflammation, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:1, 1928.

SPHENOID SINUS

Wagner [36] stressed the similarity of certain signs and symptoms of sphenoiditis to intracranial lesions and gave a detailed differential diagnosis of the two conditions. He stated that the symptomology may be similar, and that the diagnosis is dependent on a close neurologic, ophthalmic and otorhinologic examination combined with roentgen and ventricular study. To facilitate the differential diagnosis, intracranial lesions may be divided into three groups, two of which may be simulated by sphenoiditis. In class I, or lesions with focal symptoms, it is least difficult to make a diagnosis, because it is self-evident that the focal symptoms confirm not only the diagnosis but the location of the lesion. In class II, or lesions with choked disk, it is less difficult, but in sphenoiditis the papilledema is absent invariably and optic neuritis characterized by sudden loss of vision and a central scotoma, enlargement of the blind spot and concentric contraction of the light and color fields is present, whereas in tumor of the brain the ears are normal on inspection, and there is a choked labyrinth. Class III, or lesions without choked disk, is the most difficult to differentiate. Usually focalizing signs with fields of vision and posterior fossa symptoms with normal ears and pathologic signs in the nose facilitate diagnosis.

Guerra [37] reported a case of thrombophlebitis of the cavernous sinus resulting from sphenoid sinusitis.

Elfman [38] cited a case of a man 44 years of age, an asthmatic person, who at operation showed a dehiscence of the posterior wall of the left sphenoid. As a result of the operation the patient developed meningism and encephalitis, but finally recovered.

ACCESSORY SINUSES IN GENERAL

Robinson [39] has added to his previous report 25 cases of nasal polypi in which radiation therapy was given. The results on this series has confirmed his previous conclusions, namely: 1. No pain or overaction has resulted from the use of the radium. 2. There is less recurrent polypoid tissue, and it is more fibrous than myxomatous. 3. Longer freedom from recurrences and in several cases none has taken place. 4. Chronic nasal discharge, headaches and asthmatic attacks have been decreased.

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36. Wagner, W. A.: Similarity of Signs and Symptoms of Sphenoiditis to Intracranial Lesions and Their Differential Diagnosis, South. M. J. **22**:478, 1929.

37. Guerra, P.: Thrombophlebitis of Cavernous Sinus from Sphenoid Sinusitis, Arch. di ottal. **35**:337, 1928.

38. Elfman, L. K.: Dehiscence of Posterior Wall of Sphenoid Sinus: Case Report, Laryngoscope **39**:131, 1929.

39. Robinson, G. A.: Treatment of Polypoid Sinusitis, Arch. Otolaryng. **10**:72 (July) 1929.

Kern and Schenck [40] made a study of 200 asthmatic patients and 50 so-called normal patients to determine the relative efficiency of the clinical and roentgenologic methods of diagnosis. Eighty-six patients of the asthmatic group were operated on, these patients serving as a basis for checking clinical and roentgen examinations. From the total series, the authors make the following conclusions:

1. Neither the roentgen nor the clinical examination of the paranasal sinuses is 100 per cent accurate or comes anywhere near it.

2. Of the two, the roentgen examination is the more sensitive, especially in the study of the ethmoidal and the sphenoidal sinuses.

3. The roentgen examination will pick up the evidences of sinus disease, past as well as present: positive results in the roentgen examination therefore do not imply clinically active disease.

4. The attempt to interpret roentgen observations in terms of pathologic change (thickened mucous membrane, polyps) may be misleading, since the alleged diagnosis is not infrequently erroneous.

5. Roentgen examination often overlooks acute recent sinus infection.

6. Clinical examination alone is able to give positive proof of active sinus disease, and that only if pus is seen coming from the ostium of the sinus.

7. Clinical examination frequently overlooks chronic disease, especially of the ethmoidal and sphenoidal groups, if there is no abnormal secretion in the corresponding drainage areas, and the mucous membrane as seen by the nasopharyngoscope shows little if any change.

8. It is therefore desirable that patients suspected of having chronic sinus disease be reexamined several times before a negative clinical opinion is given.

9. Clinical examination will at times reveal the evidence of past sinus disease, although not as frequently as roentgen examination.

10. Observations made by transillumination are at times fallacious; polyps or mucoid secretion may transmit light normally; pathologic change due to former sinus disease or normally thick bone may be wrongly interpreted in terms of active disease.

11. Neither method is therefore to be relied on alone; both must be used as a routine in the study of patients in whom sinus disease is suspected.

12. A positive observation in suspected chronic cases by either method of examination justifies the statement that a sinus may be, but not that it is, actively diseased, except in the presence of pus or polyps.

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40. Kern, R. A., and Schenck, H. P.: Relative Efficiency of Clinical and Roentgenologic Methods for Sinus Disease Diagnosis, with Observations on Incidence of Sinus Disease; Based on Findings in Two Hundred Asthmatics and Fifty So-Called Normals, Am. J. M. Sc. **178**:168, 1929.

13. In asthmatic patients a positive observation made by either method of examination not only justifies, but indicates, the opening of the affected sinus.

14. Sinus disease is prevalent in patients of all ages.

S. A. and F. P. Schuster [41] stressed the following points in a paper on sinus infection and influenza. First, influenza is a disease of the respiratory epithelium, especially of the upper respiratory tract. The frequency of the influenzal sinusitis varies with the different epidemics. The symptomatology does not differ greatly from the sinusitis seen in other respiratory infections, except perhaps in the peculiar cyanosis of the mucous membranes seen in the early stage of influenzal rhinitis and sinusitis with its concomitant epistaxis. The treatment in the early stages must be conservative in the establishment of drainage and aeration, as most of the cases resolve themselves. If the condition becomes subacute or chronic, the treatment is the same as for other sinus infections.

Lederer and Livingston [42] reviewed the literature on tuberculosis of the sinuses, and reported a case of their own. From their study of the literature it appeared that some cases of tuberculous sinus disease were limited to the mucous membranes of the sinus, and in such cases surgical intervention was usually successful in removing the process and effecting a cure. In the great majority of cases, however, including their own, extensive bony involvement was found, and surgical intervention failed to prevent intracranial invasion and death.

Carmody and Greene [43] expressed the belief that without sinus infection or without pathologic membranes, irritants, such as dust, pollens, bacteria, foods and emanations of all sorts, do not produce the so-called allergic coryza or hay-fever. In summarizing, they stated that the maxillary sinus is the most commonly infected, as Schadle pointed out twenty years ago. Next in frequency are the ethmoidal, frontal and sphenoidal sinus.

Carmody [44] stated the following conclusions in an article on the development of the sinus after birth:

The infant does not exist who has reached the age of 1 year without the so-called acute cold.

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41. Schuster, S. A., and Schuster, F. P.: Nasal Accessory Sinuses in Influenza, Southwestern Med. **13**:116, 1929.

42. Lederer, F. L., and Livingston, G. S.: Tuberculosis of Nasal Accessory Sinuses, Ann. Otol. Rhin. & Laryng. **37**:1176, 1928.

43. Carmody, T. E., and Greene, L. W.: Relation of Sinus Disease to Hay Fever, Tr. Am. Acad. Ophth. **33**:445, 1928.

44. Carmody, T. E.: Development of Sinuses After Birth, Ann. Otol. Rhin. & Laryng. **38**:130, 1929.

The number of attacks and duration of trouble before a chronic sinus change takes place depend on individual variations, due to susceptibility, virulence of infection, etc. In some cases only one attack occurs, in others many, before sufficient change can be noted roentgenologically.

Infection of the maxillary and ethmoid sinuses early in life interferes with the development of the frontal sinuses.

Infection of the surface of the mucous membrane will not cause a roentgenographic shadow, while deeper infections will.

Baum [45] makes a plea for conservative surgical measures in the treatment for sinus conditions, basing his arguments on the normal physiology of mucous membranes, especially the action of the cilia. The treatment should be directed toward restoring the nasal ciliary functions, using the minimum amount of surgical measures toward that end.

Esch [46] reported two cases of foreign bodies in the sinuses simulating tuberculosis. In the first patient a cotton plug was removed from the left antrum of a woman 44 years of age. It had been in the sinus for ten years. The other patient was a man, aged 44, who had been operated on one year previously for a suppurating dental cyst. The patient stated that the cyst was packed for several months, and that it had healed, but that a purulent discharge developed in the nose and still persisted. A Caldwell-Luc operation was done on both, and a cure resulted. In both cases the effects of foreign bodies and of infection could be observed. The thin mucous membrane was changed to a dense cicatricial membrane from 2 to 3 mm. thick and closely adherent to the bone. Large giant cells attached themselves about the foreign bodies. In the contiguous area nodules of epithelioid cells had formed. Lymphocytes were found in these nodules and around them. In the first case nodules were found that could not be differentiated from the epithelioid cell tubercles. The author pointed out that the diagnosis is important from the standpoint of therapy, but that it may be difficult to establish because there is no morphologic difference and because the tubercle bacillus may be present but not demonstrable. In the author's cases the morphologic picture would not have allowed him to make a differential diagnosis between tuberculosis and foreign body formation if he had not found the foreign body formations in the other half of the suspicious tissue in the control investigations.

OCULAR COMPLICATIONS

For the past year the articles on ocular complications have been numerous, especially in ophthalmologic journals.

45. Baum, H. L.: Some Practical Considerations in Problem of Sinus Infection and Drainage, Ann. Otol. Rhin. & Laryng. **38**:152, 1929.

46. Esch: Ztschr. f. Hals-, Nasen- u. Ohrenh. **23**:29, 1929.

Fenton [47] has given a good summary of the literature on intranasal operations for the relief of optic neuritis.

Ellett [48] expressed the fact that there are many causes for retrobulbar neuritis other than sinus trouble.

Davis [49] reviewed 33 cases of orbital inflammations that he had observed. Twenty-three of these patients had sinusitis, and in 16 of them the frontal sinus was involved. In his experience this sinus was the commonest cause of orbital inflammation.

Hill [50] expressed the belief that some rhinologists have gone to extremes in attributing a great many ocular disorders to sinus disease, and that they have confused the signs of intracranial pressure with inflammatory lesions of the optic nerve to the detriment of the patient, who has been subjected to unnecessary surgical measures and has lost time in getting relief from intracranial pressure. On the other hand, he is of the opinion that some ophthalmologists have erred in the opposite direction in denying the responsibility of sinus disease for a small group of optic neuropathies. He has been forcibly impressed by the few cases he has seen in which there can be no reasonable doubt that vision was saved by the prompt cleaning up of sinus infection.

Escat [51] advised the removal of the middle turbinate and opening of the sphenoidal sinus in all cases of optic neuritis of a problematic nature.

Scheerer,[52] in a paper on the subject of retrobulbar neuritis, stated that in the past seven years he has seen 200 cases, of which at least 55 per cent were caused by multiple sclerosis. From 4 to 10 per cent were definitely due to disease of the nasal sinuses, and from 15 to 20 per cent were suspected of originating from disease of the nasal sinuses. The remainder of the cases resulted from general causes. In considering this subject, he stated that in numerous cases the disease of the optic nerve is the first sign of multiple sclerosis. He raised the question which others also have raised as to whether disease of the nasal sinuses does not prepare the ground for the development of multiple sclerosis,

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47. Fenton, R. A.: Present Status of Intranasal Operations for Relief of Involvement of Optic Nerve, Arch. Otolaryng. **9**:637 (June) 1929.

48. Ellett, E. C.: Relative Importance of Disease of Nasal Sinuses as a Cause of Disease of the Optic Nerves, Arch. Otolaryng. **10**:49 (July) 1929.

49. Davis, E. D. D.: Inflammatory Affections of Orbit of Nasal Origin, J. Laryng. & Otol. **44**:164, 1929.

50. Hill, E.: Nasal Accessory Sinuses in Relation to Diseases of Optic Nerve, New York State J. Med. **29**:135, 1929.

51. Escat, E.: Cure of Optic Neuritis by Excision of Middle Turbinate Bone and Opening of Sphenoid Sinus: Cases, Ann. d. mal. de l'oreille, du larynx **47**: 1065, 1928.

52. Scheerer: Arch. f. Augenh. **99**:322, 1928.

and he stated that actually there has been a series of cases in which in spite of successful operations on the nose multiple sclerosis has developed later.

Herzog [53] divided his clinical material comprising 75 cases of retrobulbar neuritis into two groups. The first group consisted of 28 cases, in 12 of which the condition probably was due to hysteria, alcohol, arteriosclerosis and multiple sclerosis. Only 4 of the remaining 16 cases in this group showed disease of the nasal sinus. The patients in the first group were those who came to the hospital on account of their eyes. The 47 patients in the second group did not complain definitely about the eyes, but entered the hospital because of nasal sinusitis. Careful examination of the eye disclosed some evidences of retrobulbar neuritis, particularly an enlargement of the blind spot. Those in the second group were the only cases of retrobulbar neuritis found by the author in 500 cases of suppuration of the nasal sinuses from 1919 to the beginning of 1927. In 435 of the 500 cases of suppuration of the nasal sinuses, the condition was chronic, and in 65 it was acute. Symptoms of retrobulbar neuritis were found in 33 cases of chronic suppurative sinusitis and in 15 cases of acute sinusitis. The ophthalmologic observations varied from extensive scotoma with appreciable enlargement of the blind spot to a slight enlargement of the blind spot with normal visual acuity. Of the 16 cases in the first group, 4 of which showed disease of the nasal sinuses, complete recovery occurred in 9, partial recovery in 4 and no improvement in 3. Of the 15 cases with positive evidence of infection in the second group, complete recovery occurred in 10, partial in 1 and no improvement in 2.

SINUSITIS IN CHILDREN

Weinstein [54] stated that sinusitis in infancy and childhood is as frequent as in adult life. That early radical measures may be undertaken regardless of age is indicated. He stressed the importance of combined study of obscure cases by the pediatrician and the rhinologist.

Brown [55] advised first, removal of tonsils and adenoids; second, proper diet; third, sunshine, sun baths and light therapy; fourth, vaccines, which may help in some cases and are especially of benefit in preventing reinfections; fifth, warm dry climate if possible, and sixth, for local treatment, ephedrine and warm saline washes.

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53. Herzog: Arch. f. Augenh. **99**:292, 1928.

54. Weinstein, M. A.: Sinusitis in Infancy and Childhood, M. J. & Rec. **130**: 95, 1929.

55. Brown, J. M.: Sinusitis in Children, Tr. Am. Laryng., Rhin. & Otol. Soc. **34**:453, 1928.

Fowler [56] studied 100 cases of lesions of the ear in children with special references to the sinuses. He found that 57 per cent showed moderate or severe involvement, 71 per cent showed pathologic changes in the ethmoidal septums and 86 per cent showed positive pathologic changes in the sinuses. The chronicity of the suppuration was directly proportional to the involvement of the sinus spaces and indirectly proportional to the pathologic changes in the ethmoid septums. He concluded that diseases of the nasal sinuses and aural disease are intimately associated, and treatment should be directed to both conditions. There was no suspicion of a present or past suppuration in the ear in only 4 cases, 4 per cent. In no case were the nasal sinuses entirely normal.

Theisen,[57] in a paper on ethmoiditis in infants and young children with orbital complications, advised conservation in treatment. Radical operation on the ethmoid bone, except in cases in which there is evidence of external rupture and severe eye and orbital complications or other severe systemic conditions, should not be performed until all conservative methods of intranasal treatment have been carried out. The author has come to view all cases of persistent nasal discharge in young children and infants in the absence of acute nasal colds as possible sinusitis and in children under 4 years old as probable ethmoiditis.

ROENTGENOLOGY OF THE SINUSES

Many articles continue to appear on the use of opaque oils as an aid in roentgenology of the sinuses. The question of its value is still an open one. From reading the literature on the subject for the past few years one comes to the opinion that its use is regional and dependent on the customs of the otolaryngologists of certain localities. Where rhinologists take and interpret their own roentgenograms, they can evidently do better work with the aid of an opaque oil. In other localities where an expert roentgenologist is used to take the roentgenograms and also to interpret them, the reverse is true. Roentgenologists who are doing sinus work interpret pathologic signs in the sinuses accurately and do not allow their very exact picture of the pathologic process, as shown by the flat plate, to be confused by the addition of an opaque oil, with consequent possible filling defects. These physicians should be able to tell the exact conditions in a sinus: whether activity is present or not, whether there are thickened linings, polypoid linings,

56. Fowler, E. P.: Incidence of Nasal Sinusitis with Diseases of Ear; One Hundred Cases in Children, Tr. Am. Laryng., Rhin. & Otol. Soc. **34**:229, 1928; Arch. Otolaryng. **9**:159 (Feb.) 1929.

57. Theisen, C. F.: Ethmoiditis in Infants and Young Children with Accompanying Eye and Orbital Complications, Tr. Am. Laryng. A. **1**:163, 1928.

bone necrosis, cysts, etc. Interpretation of x-ray plates is a specialty in itself just as much as rhinology is. A good x-ray plate is infallible. The pathologic process is shown in it and is only waiting for the expert to interpret it properly. Articles on this particular subject have been published by Wolf,[58] Van Osdol,[59] Proetz,[60] Trible and Bierman,[61] Weil and Henderson,[62] Allen,[63] Anderson,[64] Fraser [65] and Todd.[66]

Fetterolf and Sprenkel [67] studied a series of cases to determine the agreement between transillumination and roentgenograms of the frontal sinus. In the series the frontal sinuses were decidedly smaller by roentgen examination than they appeared on transillumination, the usual difference being from one-half to three-fourths inch in the extension upward in the frontal line.

Israel [68] advocated an upward position and a vertical roentgenographic unit for roentgen examination of the sinuses.

Overgaard [69] recommended an oblique method, for which he claimed the following advantages:

Roentgenograms taken in the oblique position cause little overlapping of the anatomic structures. Both the right and the left side can be examined at the same time. Molar teeth are more clearly demonstrated.

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58. Wolf, G. D.: Study of Antrum Disease with Aid of Injection of Iodized Oil, New York State J. Med. **29**:193, 1929.

59. Van Osdol, H. A.: Diagnosis of Sinus Disease by Injection of Opaque Solutions, Ann. Otol. Rhin. & Laryng. **37**:943, 1928.

60. Proetz, A. W.: Sources of Error in Sinus Radiography with Fluid Contrast Media, Ann. Otol. Rhin. & Laryng. **37**:806, 1928.

61. Trible, G. B., and Bierman, M. I.: Use of Lipiodol (Iodized Oil) in Maxillary Sinus Diagnosis: Preliminary Report, U. S. Nav. M. Bull. **27**:306, 1929.

62. Weil, A. I., and Henderson, W. F.: Use of Lipiodol as Aid to Diagnosis of Nasal Sinus Condition: Preliminary Report, New Orleans M. & S. J. **81**:426, 1928.

63. Allen, K. D. A.: Sinus Radiography for Proetz Method of Sinus Study, Ann. Otol. Rhin. & Laryng. **37**:1212, 1928.

64. Anderson, H. C.: Use of Iodized Oil in Diagnosis of Nasal Sinus Disease, Arch. Otolaryng. **7**:51 (May) 1928.

65. Fraser, R. H.: Diagnostic Uses of Lipiodol (Iodized Oil) in Paranasal Sinuses, Radiology **12**:6, 1929.

66. Todd, H. C.: Simplified Method for X-Ray Studies of Accessory Nasal Sinuses, Laryngoscope **38**:688, 1928.

67. Fetterolf, G., and Sprenkel, E. E.: Comparison of Outlines of Frontal Sinus in Vivo as Shown by Transillumination and Roentgen Ray, Arch. Otolaryng. **9**:181 (Feb.) 1929.

68. Israel, S.: Vertical Roentgenographic Unit; Roentgen Examination of Head and Other Parts of Body in Upright Position, Am. J. Roentgenol. **20**:481, 1928.

69. Overgaard, A. P.: Roentgenograms of Sphenoid and Ethmoid Sinuses: Oblique Method, Arch. Otolaryng. **8**:663 (Dec.) 1928.

Definite landmarks make oblique views capable of uniform duplication. Stereoscopic views are essential for accurate diagnosis.

Pfahler,[70] in a paper on roentgenologic signs that indicate extension of infection from the ethmoid and sphenoid sinuses to the base of the skull, stressed the well known chronic osteitis often seen as the result of a long-standing chronic process, present or past, in the sinuses.

OSTEOMYELITIS

Williams [71] reported a case of osteomyelitis of the frontal bone in which cure was eventually obtained following radical exposure and removal of the diseased process. The condition of the patient showed marked improvement following the use of a nonspecific protein in the form of typhoid vaccine. Whether the same improvement would have taken place without its use or not the author cannot say, but the pronounced subjective and objective improvement immediately following its use suggests that it may have been of service.

Watkyn-Thomas and McKenzie [72] reported their bacteriologic observations in one case of osteomyelitis of the superior maxilla following a nasal operation. Fear of extension to the cranial vault led to a gap being cut in the sphenoid and temporal bones from near the external angular process of the frontal to the root of the zygoma in front of the ear. The gap thus formed lay at a distance of about 1 inch from the manifest lesion in the face. Cultures were taken from four fragments of bone removed by the gouge in making the gap and were numbered 1 to 4, according to their depth from the surface of the bone. The laboratory report was as follows: The smears from no. 1, the most superficial, yielded a few leukocytes and an occasional gram-positive coccus. No bacteria were seen in any of the other smears. The cultures from 1, 3 and 4 each contained a few colonies of a coliform bacillus. Culture 2 yielded a few colonies of a coliform bacillus and streptococcus. The bacteriologist, Dr. Osborn, is of the opinion that the coccus is a contamination, but that the presence of a coliform bacillus indicates infection by the latter organism. The authors presented the foregoing unexpected observations for what they may be worth, and advised further investigation along the same line.

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70. Pfahler, G. E.: Roentgenologic Signs Which Indicate Extension of Infection from Ethmoid and Sphenoid Sinuses to Base of Skull, Arch. Otolaryng. **8**: 638 (Dec.) 1928.

71. Williams, H. L.: Case of Osteomyelitis of Frontal Bone Following Incomplete Operation for Acute Frontal Sinusitis, Proc. Staff Meet., Mayo Clin. **3**:338, 1928.

72. Watkyn-Thomas, F. W., and McKenzie, Dan: J. Laryng. & Otol. **44**: 253, 1929.

Brandt [73] reported a case of abscess of the frontal lobe following a severe infection of the frontal sinus, which produced an osteomyelitis of the frontal bone. The patient made an excellent recovery following operation.

Terracol [74] stated that the infantile antrum becomes infected more frequently after than during birth, generally by infection acquired during nursing. True osteomyelitic changes take place, causing unilateral nasal discharge and swelling of the lids and cheek, which may be confused with dacryocystitis, gonorrheal ophthalmia or syphilitic osteitis. Fistulization may occur in the alveolar region, the inner canthus or the hard palate. The rudimentary canine or premolar teeth will be found on incision of the labiogingival lying bathed in pus; the necrotic bone should be carefully curetted, and if possible nasal drainage should be increased. Excessive curetting is to be discouraged. In spite of the mortality of from 30 to 50 per cent due to various systemic complications, the surviving cases present no facial or palatal asymmetry, save for the loss of the teeth.

PULMONARY SUPPURATION

Quinn and Meyer [75] found that 22 of 38 patients, or 57.9 per cent, with bronchiectasis had coexisting sinusitis. As a class, the patients with sinusitis were younger than those without. The majority of these patients had no symptoms referable to the sinuses. The authors could establish no relationship between the degree of sinus trouble and the bronchiectasis. They proved that iodized oil could be aspirated in large amounts into the lung from the nasal fossae during sleep. From this they stated that it is logical to believe that infectious material and pus could be aspirated in the same way, and this they concluded to be the most important explanatory factor for the frequent concomitance of chronic sinusitis and bronchiectasis.

Cramer, Roch and Wissmer [76] reported a case of sinusitis with pulmonary complications caused by an infected dental cyst.

Dunham [77] also stressed the importance of the sinuses as a cause of secondary infection of the lung.

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73. Brandt: Laryngoscope **38**:712, 1928.

74. Terracol: Arch. internat. de laryng. **7**:732, 1928.

75. Quinn, L. H., and Meyer, O. O.: Relationship of Sinusitis and Bronchiectasis, Arch. Otolaryng. **10**:152 (Aug.) 1929.

76. Cramer, A.; Roch, E., and Wissmer, A.: Sinusitis and Pulmonary Complications Caused by Suppurative Dental Cyst, Rev. méd. de la Suisse Rom. **49**: 162, 1929.

77. Dunham, K.: Chronic Nontuberculous Lung Infection Secondary to Chronic Sinus Infection, J. Med. **9**:312, 1928.

News and Comment

COLORADO CONGRESS OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

The program of the congress, which will be held on Aug. 1-2, 1930, is announced. The papers on ophthalmology are:

1. Dr. Roderick O'Connor, Oakland, Calif.: Ocular Muscle Action Under Sherrington's Law; Its Influence on Operative Results.

2. Dr. Beulah Cushman, Chicago: Tuberculous Iridocyclitis.

3. Dr. A. M. Lemoine, Kansas City, Mo.: Subject to be announced later.

4. Dr. J. S. Friedenwald, Baltimore: Pigmentary Degeneration of the Retina in Late Neurosyphilis.

5. Dr. H. G. Merrill, Provo, Utah: Uveitis Associated with Parotitis.

6. Dr. A. B. Bruner, Cleveland: Some Clinical Aspects of Acute Glaucoma.

7. Dr. Edward Jackson, Denver: The Control of Myopia.

The following are the papers on otolaryngology:

8. Dr. L. W. Dean, St. Louis: The Relationship Between Otolaryngology and Internal Medicine and Pediatrics.

9. Dr. A. M. Painter, Kansas City, Mo.: The Tonsil Question.

10. Dr. T. S. Blakesley, Kansas City, Mo.: An Operation for Chronic Dacryocystitis.

11. Dr. B. L. Myers, Kansas City, Mo.: Subject to be announced later.

12. Dr. J. F. Barnhill, Indianapolis: Are Otolaryngologists Operating More than Necessary?

13. Dr. Lewis Fisher, Philadelphia: A Proved Case of Brain Abscess Complicating Middle Ear Suppuration; Methods of Diagnosis.

14. Dr. L. W. Oakes, Provo, Utah: Sphenoidal Sinus Syndrome.

SAGINAW VALLEY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

On June 6, 1930, at the Hotel Bancroft in Saginaw, Mich., the eye, ear, nose and throat specialists of Saginaw Valley organized the Saginaw Valley Academy of Ophthalmology and Otolaryngology. The society will hold its meetings monthly except during the months of July and August. The following officers were elected: president, Dr. Frederick J. Cady, Weichmann Bldg., Saginaw, Mich.; vice-president, Dr. P. R. Urmston, Davidson Bldg., Bay City, Mich., and secretary-treasurer, Dr. Walter K. Slack, Eddy Bldg., Saginaw, Mich. Meetings are held the first Friday of the month. The place of meeting varies between cities. Dr. Charles Baker of Bay City presented the first paper, on deafness.

THE AMERICAN BOARD OF OTOLARYNGOLOGY

To better carry on its work, The American Board of Otolaryngology will increase the certificate fee from $25 to $50. The new rule becomes effective Jan. 1, 1931.

An examination was held in Detroit, on Monday, June 23, 1930, at which time seventy-eight candidates were examined, of whom sixty-five were passed, one was conditioned in pathology and twelve failed.

The next examination will be held in Chicago on Monday, Oct. 27, 1930. Those interested will please advise the Secretary, Dr. W. P. Wherry, 1500 Medical Arts Building, Omaha.

CASSELBERRY PRIZE FUND

The sum of $500 having accrued from the Casselberry Fund for encouraging advancement in the art and science of laryngology and rhinology, the sum is now available, in part or as a whole, for a prize award, decoration or the expense for original investigation and research in the domains mentioned. Theses or reports of work must be in the hands of the Secretary, Dr. George M. Coates, 1721 Pine Street, Philadelphia, before February 1 of any given year.

Abstracts from Current Literature

Ear

SOME EFFECTS IN LATER LIFE OF OTITIS MEDIA IN INFANCY. C. C. BUNCH and R. C. GROVE, Ann. Otol. Rhin. & Laryng. **39**:1 (March) 1930.

A detailed study was made of a series of eighty cases in an effort to determine the effects of otitis media in infancy on the acuity of hearing in later life. The plan was to secure accurate information regarding any impairment of hearing that might be present from seven to fifteen years after the occurrence of a definite suppurative otitis media observed and treated during hospitalization on a pediatric service. Roentgenograms were made of the mastoids in order to determine the effect of this infection of the middle ear on pneumatization. Only those cases in which three or more myringotomies had been performed were included in the series. At the time of examination, the ages of the children selected ranged from 7 to 16 years. At the time of admission to the hospital when the otitis media was present, their ages ranged from 2 days to 4 years and 8 months, forty-seven being under 1 year of age.

Thirty ears, or 19 per cent, had appreciable loss of hearing when examined. Ten of these thirty ears were discharging. Dry perforations were present in five. In twelve ears the tympanic membranes were normal. The otoscopic examination, except in cases in which discharge was present, gave the examiner little idea as to the relative hearing power. Roentgenograms revealed normal development in thirty-one mastoids, while sixty-seven were reported sclerosed or with some other form of arrested pneumatization. The authors conclude that factors other than otorrhea alone must play an important part in the loss of acuity in hearing and in the pneumatization of the mastoid.

A CONTRIBUTION TO THE ETIOLOGY OF PROGRESSIVE DEAFNESS. MARK J. GOTTLIEB, Laryngoscope **40**:85 (Feb.) 1930.

A careful study of the pancreatic function in twenty-one cases of progressive deafness was made by the author in an effort to determine a possible relationship between a defect in pancreatic digestion and a deterioration in hearing. The work comprised the results of examination of the urine, particularly for sugar; the determination of the amount of sugar in the blood; the estimation of the amount of trypsin, amylopsin and steapsin in the fluid extracted from the duodenum, and, whenever possible, the evaluation of the sugar tolerance. In this way, the acinous as well as the insular function was considered. The blood for chemistry observations was taken after starvation for over twelve hours, as were also the duodenal contents.

Of the twenty-one cases, nine were cases of otosclerosis and twelve of nerve deafness. Fourteen of the series revealed a definite lowering of the digestive capacity in one or more of the pancreatic ferments. Five of the cases gave blood sugar figures higher than the average normal figures and two of them showed sugar in the urine. The author believes that these persistent observations suggest the possibility of a causal relationship between defective hearing and pancreatic disturbances.

Treatment of these patients with pancreatic extract was carried out with definite improvement in practically all of them, but the author realizes that the results obtained are not conclusive owing to the small series of cases and to the fact that the hearing tests in otosclerosis vary considerably from time to time under varying conditions. Only four of the twelve patients with nerve deafness were treated. They revealed more definite improvement than did the group with otosclerosis.

SNAPP, Grand Rapids, Mich.

Pharynx

THE LINGUAL TONSIL. M. V. MILLER, Laryngoscope **40**:117 (Feb.) 1930.

A plea is made by the author for a more careful and painstaking study of the lingual tonsil in the course of an ordinary routine examination. Little attention, as a rule, is paid to these structures in spite of the fact that they may be the seat of serious trouble. The lingual tonsil lies on the base of the tongue and is made up of a variable number of lymphoid nodules. These nodules may be small and discrete or may attain considerable size, giving the appearance of a large single mass. They often appear to be extensions from the lower pole of the faucial tonsils, but a fibrous separation between the two is practically always present.

Among the pathologic conditions of the lingual tonsils to be considered are: acute and chronic inflammations, abscesses of varying severity, hyperkeratosis, tuberculosis, syphilis and occasionally papilloma, fibroma and angioma. Carcinoma and sarcoma rarely occur. Of these, the acute and chronic inflammations are the most common. Repeated attacks of acute sore throat may occur and the cause be entirely overlooked without the use of the laryngeal mirror, which will reveal swollen, inflamed lingual tonsil tissue, frequently covered with white follicles. Chronic persistent cough may be the result of an irritation and tickling of the pharynx from contact with enlarged, chronically infected lingual tonsils. Chronic infection of this tissue may cause various systemic conditions, such as arthritis, cystitis and endocarditis. The best treatment for chronic involvement of the lingual tonsil is surgical removal, though galvanocautery is of decided value.

SNAPP, Grand Rapids, Mich.

Nose

SUDDEN ALLERGIC REACTIONS LOCALIZED IN THE ANTRUM. ARTHUR W. PROETZ, Ann. Otol. Rhin. & Laryng. **39**:87 (March) 1930.

Observations based on a series of roentgenograms examined over a period of four years reveal that the lining membrane of the maxillary sinus, under the influence of an allergic reaction, can increase in thickness from a fraction of a millimeter to as much as 1 cm. overnight. The appearance of polypi, diffuse edema and similar filling defects commonly noted in roentgenograms of the antrum has long been regarded as the result of chronic inflammation, and is often considered sufficient evidence of hyperplasia to justify more or less radical surgical measures. The injection of certain radiopaque substances into the sinuses reveals the fact that a membrane may swell to several times its normal thickness between the time of the original injection and that of the seventy-two hour plate. The author found the percentage of persons reacting in this fashion to vary from 5 to 20, depending on the substance employed. In the early cases of the series, iodized poppy seed oil 40 per cent, diluted one-half with olive oil, was used as a radiopaque substance, and only an occasional instance of rapid thickening was encountered. Later a new substance was used. This was undiluted, but was a halogen compound of certain esters of the acids of olive oil. In this series about one in five patients showed a demonstrable sudden thickening of the lining antrum membrane. This was at first thought to be due to a possible irritating action of bromine on the sinus membrane, but after a careful study it was concluded to be allergic. These patients all gave marked allergic reactions to the various proteins and external stimuli. The olive oil in the sinus or the trauma from the trocar puncture may be responsible for the allergic reaction manifesting itself locally within the antrum, as was sometimes the case. Mineral oil is advocated as a diluent for radiopaque substances in allergic individuals. The author urges that allergy be excluded in all cases before a surgical procedure is undertaken, as in one case reported the antrum was found to be normal at operation while at the time of the roentgenogram there was a definite filling defect.

SOME EXPERIENCES IN THE SURGICAL TREATMENT OF INFLAMMATION OF THE FRONTAL SINUS, AND ITS COMPLICATIONS. HERBERT TILLEY, Laryngoscope **40**:165 (March) 1930.

One of the fundamental factors in handling inflammation of the frontal sinus is a thorough knowledge of the anatomy of this sinus and the surrounding structures. The author also urges that one should never forget that inflammation is a protective reaction on the part of the tissues in their effort to resist and overcome a noxious invader, and therefore every detail of the treatment should aim at a minimum of trauma. It is then obvious that surgical intervention is merely an aid to Nature in her struggle for restitution and should consist primarily in the establishment of free, spontaneous and permanent drainage of the products engendered by both invader and defender. In acute inflammations simple applications of various medication intranasally to relieve swelling and congestion frequently bring about free drainage sufficient to clear up the condition. Should this fail, removal of the tip of the middle turbinate, together with conservative operative procedures about the nasofrontal duct, will bring the desired results. Irrigation of the sinus is advisable. When the infection has passed through the bone to reach the periosteum and edema of the soft tissues results, it is unlikely that anything but an external operation will suffice. The author warns against the removal of acute or chronically inflamed mucous membrane from an infected frontal sinus, as the adjacent diploe may be uncovered, thus allowing septic organisms to enter and cause a spreading osteomyelitis.

The author's experience of more than a quarter of a century has taught him that the number of cases of chronic suppuration of the frontal sinus which require external radical operation are few. The type of intranasal operation used is that introduced by Schäffer and developed by Ingals and again by Halle. The electrically driven burr is not used on account of the element of danger introduced. The importance of careful after-treatment is stressed.

Among the indications for a primary external operation are: (1) a very narrow nasal passage preventing free access to the ethmoidal region; (2) a tortuous frontonasal canal; (3) an extensive, irregular and loculated sinus; (4) attacks of subacute periostitis of the anterior or inferior wall of the sinus, and (5) symptoms of subdural abscess. A secondary external operation is required when intranasal measures have failed to relieve the chief symptoms, such as headache and profuse discharge.

Among the complications arising from the operation are diplopia, postoperative orbital cellulitis, anesthesia following injury to the supra-orbital nerve, meningitis and diffuse spreading osteomyelitis of the frontal bone. The last two are the most serious, as they are nearly always fatal.

BRAIN ABSCESS FROM THE STANDPOINT OF THE OTOLARYNGOLOGIST. WELLS P. EAGLETON, Laryngoscope **40**:336 (May) 1930.

The chief routes of infection in abscess of the brain are venous channels and perivascular spaces. This has been revealed by microscopic study of the intima of the cerebral veins and the perivascular space surrounding the vessels, for abscess of the brain may originate from either a retrograde thrombophlebitis or an infiltration of the perivascular space. Differentiation between the two can often be made clinically by the presence of a chill, which always accompanies an infection from the ear traveling inside the venous coat, but which is not present if the infection is traveling by the perivascular spaces.

Infarcts and abscesses of the subdural space are factors of great importance in considering the subject of abscess of the brain. A hemorrhagic infective infarct may arise from the ear and occlude one of the large cortical veins, around which occlusion there is an area of hemorrhage, while the pia-arachnoidal mesh of the cortex is covered by hemorrhagic areas. An infarct in the substance of the brain may remain quiet for some time and then develop into an abscess of

the brain. Abscesses of the subdural space are of frequent occurrence, especially over the frontal lobe. In the author's experience, practically 25 per cent of all abscesses of the frontal lobe were of this type.

Among aids to diagnosis in abscess of the brain are: (1) the knowledge of anatomically known routes through the dura, (2) the site of the original infection, (3) the importance of vomiting, (4) the value of daily routine observation of the visual fields and (5) the value of nystagmus. The following points about nystagmus in suppurative lesions are stressed: 1. Vertical nystagmus, either spontaneous or induced, suggests an involvement of the brain stem. 2. A changing spontaneous nystagmus suggests a retrolabyrinthine origin. 3. A vertical diplopia associated with or followed by a spontaneous nystagmus suggests a very deep lesion.

The performing of lumbar punctures and the administering of ether anesthesia are strongly advised against in cases of abscess of the brain.

NASAL SINUS DISEASE IN SMALL CHILDREN. L. W. DEAN, Laryngoscope **40**: 371 (May) 1930.

In considering the etiology of this condition, it should be pointed out that various investigators have concluded that one must look beyond the presence of the infectious organism to ascertain the real cause of infection. The situation was considerably clarified when Shurley demonstrated that the degree of infection was determined by the virulence of the organism plus the resistance of the cell. Deficient diet, poor hygiene, allergy, metabolic disturbances, climatic conditions, swimming, endocrine disturbances, nephrosis, diseased tonsils and adenoids, nasal blockage and infection, especially in contagious disease, are among the etiologic factors listed by the author as being concerned with sinus disease in children. Deficiency in vitamins, especially vitamin A, is of great importance, but it must be kept in mind that while a diet rich in vitamin A is essential in the treatment for sinus disease, it does not take the place of proper laryngologic treatment. This must accompany the dietary therapy.

The allergic nose must be watched for in children as well as in adults. These patients are frequently operated on unnecessarily, but it must be kept in mind that a suppurative sinusitis and an allergic condition may be present in the same instance. The author stresses the value of examining the nasal discharge for the presence of a possible eosinophilia. He states that an eosinophilia of 10 per cent or more in the nasal discharge indicates allergy. It is thought that allergy interferes with ciliary action and causes stagnation in the sinuses with resulting infection, which, when once established, may require an operation on the sinus. In such cases asthma frequently results, but is often relieved by treatment for the sinus infection. The patients treated in the author's clinic are those who have polymorphonuclear leukocytes in the nasal discharge. They have a history of an infection of the upper respiratory tract accompanied by asthmatic attacks. Vaccines and allergic treatments do not give a satisfactory result. There is evidence of sinus disease, and the polymorphonuclear cells are in the discharge during the acute attack. It is the constant appearance of evidence of infection in the sinuses at the time of the asthmatic attacks that allows one to predict a satisfactory result if the sinusitis is eradicated.

The diagnosis of sinus disease in children is often extremely difficult. There may be no nasal discharge, but simply malnutrition, a slight leukocytosis, sometimes a little fever and a history of preceding colds or influenza. The author believes that every child with a disturbance of the upper respiratory tract, followed by fever in which no demonstrable condition of the ears or lungs is responsible, should be considered as probably having a case of residual sinusitis.

The pathologic changes of nasal sinusitis in small children differ from those of the adult in that the changes due to marked chronicity are less marked. The septal walls of the ethmoidal cells are often roughened owing to absorption of

the bone. There may be thickened periosteum, subperiosteal abscesses and mucous membrane lining, which is much thickened and infiltrated with inflammatory cells. The cilia may be destroyed. Polypi formation may be present, and granulation tissue is common.

The first step in the treatment for the condition is the eradication of the cause. The diet, allergy, endocrine disturbances and all systemic etiologic factors must be considered, and a thorough examination by a pediatrician is essential in order to get a complete report on these conditions. The eradication of the predisposing factors, pediatric and laryngologic, together with the most simple local treatment, will control satisfactorily nine tenths of all cases of chronic nasal sinusitis in children without any operative work on the sinuses. These children should live a normal existence with plenty of outdoor life. Diseased tonsils and adenoids, if present, should be removed. Operations on the nasal sinuses of children, other than meatal drainage of the maxillary sinuses, are rarely indicated.

SNAPP, Grand Rapids, Mich.

Society Transactions

GERMAN OTOLARYNGOLOGICAL SOCIETY

ABSTRACTED BY ALRED LEWY, M.D., CHICAGO

Koenigsberg, May, 1929

(Ztschr. f. Hals-, Nasen- u. Ohrenh. **24**:169 [May] 1929)

PATHOLOGY AND TREATMENT OF LARYNGOTRACHEAL DYSPNEA. DR. H. MARSCHIK.

Physiology.—The pendulum movement theory of respiration of Johannes Mueller is disputed today. According to Hering and Breuer, the expiration impulse results from the expansion reflex, which is carried over centripetal vagus fibers; likewise, expiratory contraction leads to an inspiratory impulse. No inspiratory stimulus is released from the atelectatic lung (Loewy). Integrity of the respiratory center is necessary. Inspiration is also influenced by the carbon dioxide tension in the alveoli and by the temperature and dryness of the inspired air, but expiration is passive (Hofbauer). The rhythm is centrally regulated by metabolic products of the nerve cells themselves rather than directly by the carbon dioxide tension of the blood. Under all circumstances, rest takes place only at the end of expiration. The nasal mucosa also furnishes impulses of a regulatory and stimulating nature, via the trigeminus, vagus and sympathetic, which are not present in mouth breathing. Mink also believes that the erectile bodies of the middle turbinate and septum have a regulatory influence on inspiration, and those of the inferior turbinate on expiration. The content of the inspired air also stimulates expiration, principally through the cough reflex area, viz., posterior wall of the larynx and the carina. Changes in the diameter and shape of the bronchioles, the glottis and the nose also have a regulatory influence that is missing in patients on whom tracheotomy has been performed. In bodily exertion other conditions come into play, which must be considered. Here nasal respiration may not be practical or desirable.

Under the term dyspnea one must consider whether it is continuous or intermittent, or subjective or objective and whether it occurs only on exertion. By dyspnea is meant difficult and excessive breathing. Sudden obstruction produces dyspnea of greater intensity than does that of gradual development. In the latter case, objective dyspnea may not be present until high grade obstruction takes place.

Goldscheider, Joachimoglu and E. Rost, Jr., while experimenting on themselves, found that the presence of carbon dioxide rather than the absence of oxygen induced deeper and slower breathing, with compulsive breathing. The ability of the body to submerge the subjective dyspnea in chronic stenosis is remarkable. Stenosis of the larynx or upper part of the trachea induces inspiratory dyspnea; of the lower air passages, expiratory dyspnea. In the former case, it is due to negative pressure in the thorax; in the latter, to compression of the thoracic organs.

General Pathology and Clinical Observations.—The author recounts all of the conditions that can cause dyspnea: inflammations, new growths, deformities (congenital and otherwise), foreign bodies, edema, secretion and spasm; but the degree of dyspnea depends on anatomic and physiologic changes. There are predilection areas for severe dyspnea; i.e., the glottic and subglottic region, the cricoid and, especially in children, the laryngotrachea, with its relatively smaller lumen and its compressibility. Not only the larynx, but the trachea, through the musculus trachealis of the posterior wall, and the bronchioles, through their cir-

cular fibers, can actively change their caliber. Even though this has not been observed by bronchoscopists, it has been definitely demonstrated, by injections of iodized poppy seed oil and the use of roentgen rays, that there are active movements. There are also vertical movements of the laryngotracheal tube, as shown by Stupka, which are interfered with by tumors attached to the trachea, and in narcosis the danger of these tumors and other external pressure must be considered. One must also consider the increased need of air in exertion, in high altitudes, etc.

Experiments on dogs indicated that narrowing of the lumen was tolerated to the degree of from 7 to 14 per cent, but that symptoms began with less pressure, and depended on the suddenness of the narrowing.

Compensation Stadium: Relative Stenosis.—Characteristic symptoms of narrowing of the air passages are slowing and deepening of the breathing. These have to do with the changed tension and relaxation reflexes, also with the increased carbon dioxide, and may lead to hyperventilation and acapnia. Another characteristic symptom is the action of the auxiliary muscles of respiration and, with inspiration, sinking in of the soft parts due to negative thoracic pressure; in children with soft bones the muscles yield especially in the region of the diaphragm and may result in deformity of the chest. The pause at the end of expiration is omitted; it may appear at the end of inspiration in expiratory dyspnea, thus reversing the usual rhythm. Stridor, due to air swirls at the stenotic region, varies according to the location and degree of stenosis, and is to some degree diagnostic. It may be perceptible only during exertion or during sleep, when the respiration normally deepens and slows. This also occurs during narcosis through loss of compensatory adjustments of the larynx and body position, and of the tongue and epiglottis, in cases which were compensated while the patient was awake. It is probable that there is some inhibition of the dyspnea reflex, just as there is of the cough reflex. Sudden choking under anesthesia, or under morphine, may be explained by loss of this inhibition. Stridor caused in the pharynx, mouth or teeth, and even in the glottis when the cords do not abduct sufficiently, is normal for some people. In the main, stridor due to laryngotracheal stenosis is inspiratory, while that from the bronchioles is expiratory.

According to Gerhardt, in laryngeal stenosis the larynx takes a deeper position, and the head is extended to pull it upward, while in deeper stenoses the head may be flexed; this is doubted by St. Clair Thomson. In tracheal stenosis forced expiration may appear. This also occurs in diseases other than those of the respiratory system, viz., intracranial diseases or lesions, intoxication, nephritis, etc. The retention of secretion between the stenosis and the glottis adds to the difficulty. The voice is naturally affected by the condition that causes laryngeal stenosis, but in tracheal and lower stenoses it is weakened. High and loud tones are difficult of production because of the reduced air pressure at the glottis. It is also possible for the deep-seated stenosing lesion to cause recurrens paralysis. It has been noted that persons who wear tracheal tubes sometimes learn to vocalize, in inspiration; the author quotes one case in which a pharnygeal voice developed.

Insufficiency Phase: Choking.—In cases of more severe or long-continued obstruction, sooner or later rapid respiration appears. The tired respiratory center has become more susceptible to vagus impulses. In acute obstruction (foreign bodies, acute swelling), orthopnea occurs and cyanosis appears, with restlessness, anxiety and an expression of fear and suffering. In chronic obstruction there is sometimes a lead gray color. Sweating and exophthalmos indicate sympathetic irritation. Forced respiration, with inspiratory dilatation of the lungs, especially with expiratory dyspnea, leads to emphysema, and in the case of leakage of air through the alveolar walls, to interstitial emphysema. This condition may extend into the mediastinum or even into the pleural cavity. Cases have been reported in which blood vessels have been invaded, with a resulting air embolus. The author is of the opinion that the inspiratory overstretching of the alveolar walls, rather than the expiratory, causes emphysema. Dilatation of the right side of the heart occurs

with inspiratory obstruction, owing to increased filling with venous blood, and on account of deficient oxygenation, with lowered pressure in the veins. The absence of hypertrophy excludes congestion and narrowing of the capillaries of the lungs as a cause. The pulse is at first slowed, and there is an increase in volume. Pulsus paradoxicus, or weakening even during the absence of inspiration, may appear.

Valvelike breathing (Ventilatmung) was studied by Valsalva and Mueller in experiments on human beings (forced expiratory pressure with closure of the glottis). In the time of the Roman empire, it is said that the slaves learned to commit suicide thus. At first there is a raised blood pressure; later sinking occurs in the peripheral arterioles, with increased venous pressure through compression of the large veins and auricles as the heart is emptied, and increased cerebrospinal pressure through increased pressure in the sinuses; hypostatic congestion and edema of the lungs also occur. Expiratory valve breathing occurs most often in pedicled tumors of the larynx and trachea and in mediastinal tumors. Typically, this breathing can occur with bronchial glands at the bifurcation, into which the tumors can press and operate as valves. Mediastinal tumors also create pressure on the nerves; in addition to direct pressure on the airways, they decrease the thoracic capacity, and may exercise some toxic influence, as on the intrathoracic thyroid or the thymus. Valvelike breathing may occur also in the bronchi, and may lead to emphysema.

Bronchus Stenosis.—Narrowing at the bifurcation, or of both bronchi, brings about early suffocation. Even a total unilateral stoppage by circulatory disturbance may bring about death through edema of the other side. In partial unilateral block, as seen in foreign bodies, dyspnea may be present only on exertion. If the uninjured lung is normal, it may compensate fairly well, showing only an increased respiratory rate. On the affected side, breath sounds, fremitus and also thoracic excursion are lessened. There may be a drawing in of the intercostal spaces, while on the other side these spaces bulge, the excursion of the thorax is greater and the diaphragm goes deeper. Stridor is faint or absent, and it is well to make observations after exertion or during sleep. In acute complete obstruction of one side atelectasis occurs, while in partial obstruction emphysema develops. The roentgen rays show deviation of the mediastinal space, in inspiratory obstruction toward the diseased side (more common) and in expiratory obstruction toward the unaffected side.

Chronic Stenosis.—Chronic stenosis, aside from the congenital type, is characterized by slow development of the narrowing. St. Clair Thomson describes three degrees: (1) free breathing, except on exertion or increased respiratory rate in fevers, etc.; (2) constant stridor, weak voice; (3) choking spells. Mild swelling of the mucosa, accumulation of viscid secretion, especially at night when the glands function less, and dangerous narrowing in compression stenoses with circulatory changes may take place even in patients who, by the economical use of respiration, manage to avoid subjective symptoms under ordinary circumstances. The author emphasizes the need of recognizing such cases and of treating the patients, just as today the importance of free nasal respiration is recognized. Through obstruction to the venous flow catarrhal processes appear, even edema, resulting in polypoid degenerations. Below the obstruction dilatation of the trachea and bronchi occurs and general emphysema is a regular result. In bronchial stenosis, bronchiectasis, pneumonic processes and pleuritis, especially in the presence of added infection, deformities of the thorax—barrel-chest and, in young persons, sinking in of the lower part of the thorax—are frequently seen.

Circulatory System.—The condition of the heart varies with the intrathoracic pressure. Dilatation and hypertrophy of the right side of the heart are common as long as the stenosis does not overstrain; later there is passive congestion of various organs as the heart fails. The pulse curve is modified, especially during sleep and inspiration. There is an increased erythrocyte count, due to the lack

of oxygen, as occurs when a person breathes rarefied air. Neutrophilia, leukopenia, with relative lymphocytosis, and eosinophilia have been reported.

Asphyxia.—By asphyxia is meant the cessation of respiration as the end-stage of dyspnea. Cessation of respiration due to paralysis of the center, to narcosis, to intoxication or to nerve disturbances is usually not preceded by dyspnea, and is often accompanied by pulse failure. In acute asphyxia there are a loss of consciousness, clonic spasms and shallow and rapid breathing; the stridor decreases (with loss of strength), and the cyanosis becomes livid. Finally, the breathing slows and then stops. The heart usually continues to function for a while. The picture is not always the same. Aside from death by acute asphyxia in the course of a chronic obstruction, there may be sudden death without this complication. Unconsciousness occurs early in sudden choking and later in chronic obstruction. It is due to the lack of oxygen in the very sensitive cerebrum. The convulsions are usually clonic and may end in opisthotonos.

Typically, there is an increased blood pressure through irritation of the vasomotor center, which reaches its height during the convulsions, and an increased pulse rate, which is later intermittent to cessation, but usually continues after breathing stops. This description fits otherwise strong people, but as frequently happens the victims are weakened, emaciated persons, in whom heart failure occurs rapidly after unconsciousness, without convulsions. Death is not necessarily caused by asphyxia. With the respiratory and heart centers rendered very labile by intoxication, alkalosis, acidosis, narcosis, anoxemia or bodily overstrain, a slight trauma or a choking spell may be sufficient to paralyze these centers entirely, especially by irritation of the vagus terminals, particularly the supraglottic ones. This also refers to death said to be due to a bolus, a foreign body, in the laryngeal entrance. The opinion is gaining ground that thymic death is due to disturbances of internal secretion of the thymus and other endocrine organs rather than to suffocation.

Autopsy Observations.—(1) Cyanosis and darkening of the face, especially of the lips and conjunctiva, and protrusion of the eyes are found. These changes may soon disappear. (2) Ecchymosis occurs mostly in the mucous membranes, the eyelids and in the internal organs. Local passive congestion is present in the premortal, dependent parts. (3) The pupils do not present constant observations; they are usually dilated early. The discharge of urine and feces is constant, but is not characteristic. (4) Coagulation of the blood is dependent on too many contingencies to be characteristic. In animals, rapid coagulation is the rule in asphyxia. (5) Usually hyperemia of the lungs is found. Edema and bloody foam are present in the more prolonged cases. (6) Emphysema of the acute alveolar type is characteristic; it may be combined with interstitial emphysema. Emphysema also occurs in anaphylactic shock. (7) Dilatation of the right side of the heart, especially the auricle, is present. Late section may fail to reveal this change. The heart is always stopped in diastole. Hyperemia of the brain is present. The spleen is often anemic and puckered. Blood platelets are reported increased in the first twenty-four hours.

Resuscitation.—If the stenosis is of recent origin, revival and recovery after its removal can be marvelously rapid. In stenosis of longer standing, localized edemas, permanent emphysema and lobular pneumonia may develop after relief from the obstruction. Sometimes sopor continues for hours, even days, and convulsions may again occur before consciousness is restored. This has been observed especially after hanging, throttling, etc. Delirium and restlessness, and even psychic disturbances, have been noted. Death may occur despite the relief from obstruction. One case is mentioned in which death occurred thirty days later without the recovery of consciousness. This is sometimes due to injury to the vital centers. Another cause is superventilation and anoxemia. Apnea, anoxemia and death may ensue through the loss of irritability of the breathing center. Injuries caused by strangulation may determine the outcome. Tracheotomy, it must be remembered, is not an ideal restitutio ad integrum. Aside from the

bleeding, aspiration, emphysema, etc., the breathing through the cannula is not of the normal type, and the physiologic stimuli from the upper respiratory tract are lacking; hence the value of a preliminary tracheotomy performed a week before any major operation on the larynx or pharynx.

Apnea.—In tracheotomy apnea occurs after the first few breaths, and is generally ascribed to saturation of the blood with oxygen, although the real explanation is not so simple. Susceptibility to apnea is variable in different people, and in some cannot be brought about. It is more easily induced by deep breathing than by repeated shallow breaths; hence the danger in stenoses. Narcosis favors the production and duration of apnea, especially if preceded by morphine, which reduces the irritability of the respiratory center. Apnea is also produced in various ways by artificial insufflation. During apnea caused by hyperventilation, the reflex action of the center, but not the irritability of the spinal motor centers or the vasomotor center, is reduced. The tonic innervation of the diaphragm and other respiratory muscles remains. Undoubtedly apnea is dependent on the carbon dioxide content of the blood and the respiratory center. The oxygen content may be very low and even choking may take place without changing the apnea, but it is ended by the presence of sufficient carbon dioxide and through central action. Stimulation of the center by strychnine, warmth, psychic influences or pain, or by increasing its irritability, opposes apnea, as does vagus section. The function of the vagus is probably to hasten apnea, as a preventive against too great acapnia. Respiration ceases during swallowing; this is not caused by closure of the glottis, as it stops also in persons on whom tracheotomy has been performed. The suprarenal gland and hypophysis may cause apnea through anemia of the medulla. An antidote for this condition is amyl nitrate. Lobelia may cause apnea by hyperventilation. Small doses of paraldehyde or atropine may be used as an antidote. The arrest of respiration by ammonia and other irritating gases is due to closure of the glottis as a guard. Most gases that stimulate the respiratory center when given in small doses stop its function when given in large doses.

The involuntary protective reactions of the respiratory apparatus are governed principally by the trigeminus. Isolated irritation of the upper respiratory tract, causing the cessation of breathing, can be overcome by the same irritant (gas) in the lower respiratory tract. Irritation of both tracts causes incoordinate respiratory movements and finally asphyxia. Recovery after chronic stenosis is often not complete because of changes in the lungs, circulatory organs and brain, in contrast to the marvelous recoveries after the removal of foreign bodies, perforating abscesses and pedicled tumors. As recoveries are so satisfactory after the removal of foreign bodies, this procedure forms one of the milestones in medical history.

Diagnosis.—Diagnosis may be difficult in cases of acute dyspnea, especially in laryngotracheal obstruction in combination with other types. It must be determined whether there is a laryngotracheal dyspnea (especially with reference to tracheotomy) and, if present, its etiology and probable course; the condition of the heart and lungs must also be determined. The anamnesis often fails to disclose the probability of a foreign body, even when one is present. A sudden onset indicates a foreign body, chemical trauma, pseudocroup, spasm of the glottis or a pedicled new growth, while diphtheria and edema produce more gradual dyspnea. (Most of the symptoms have been described and are omitted here.) The most important information is derived by direct and indirect endoscopy. In indirect laryngoscopy in children, Dr. Marschik gets good results, even if only a momentary view, by placing the mirror against the hard palate and pulling the tongue well forward. Palpation is not to be forgotten. The presenter discussed various instruments, with special reference to illumination. The extra wide excursion of the cords in deep-seated stenosis is mentioned, and warning is given against too much manipulation in severe cases of dyspnea. Marschik advised all otolaryngologists to learn the direct method, and deplored that even today lives are lost through failure to do a simple indirect, to say nothing of a direct, laryngoscopy.

However, he warned against the dangers of direct tracheoscopy, especially in dyspneic children, in whom it may be possible to obliterate the lumen of the trachea, which is flattened over the easily bent cervical spine, particularly in narcosis, which of itself adds to the dangers. One must always be prepared for tracheotomy. Killian advised tracheotomy in all children in whom endoscopy required half an hour, but Marschik put the limit at ten minutes.

The first object of endoscopy of the trachea and bronchi is the determination of the depth of the stenosis, which is best done by counting the rings, next of the nature and extent of the stenosis and finally of the condition of the airways below the stenosis. For this reason, the author advised the use of a small caliber (8.5) bronchoscope, and stated that he was enabled to diagnose carcinoma of the bronchus below a compression of the trachea by a struma. Syphilitic stenoses are often multiple. The danger of traumatic swelling following examination in deep-seated obstruction should be remembered; also one should remember that the condition is apt to be worse than it appears under cocaine-epinephrine anesthesia, and may fluctuate under changes in blood pressure, posture, etc. Therefore, Marschik advised against trying to pass any obstruction under 3 mm. in diameter and against bronchoscopy in any case of aneurysm. The same warnings apply to biopsy below a location possible for tracheotomy. Irregular swelling and even granulations may be due to aneurysm, and this possibility should be excluded with certainty before a biopsy is attempted.

Laryngoscopy and tracheoscopy inferior can be done with many shorter instruments, such as specula, used through a tracheotomy opening, which opening is also available for bronchoscopy with the standard instruments.

Roentgen Examination.—Present-day technic makes roentgen examination an invaluable aid, not only for compression stenoses, but for all types of stenoses. Thost is quoted (Atlas) as giving an excellent differential diagnosis of tuberculosis, syphilis and carcinoma of the larynx. In struma, examination with the patient turning slowly to the side is advised, in addition to the usual anteroposterior view. Under forced expiration with a closed glottis, or closed lips and nose, yielding of the walls may be demonstrated. It is also possible today to take soft tissues in contradistinction to bone. The low position of the diaphragm, especially during expiration (paradoxic position) in stenoses, and movement of the mediastinum to the unaffected side in expiratory dyspnea and to the sick side in inspiratory dyspnea (described before) can be demonstrated. Bronchiectasis, emphysema, atelectasis, peribronchitis, etc., are also demonstrable. Finally, the use of contrast materials (iodized poppy seed oil, etc.) in the airways themselves has made a great advance in diagnosis. Marschik said that he prefers injection through the bronchoscope to limit the picture to the part desired, and advised against the use of bismuth and the injection method through the ligamentum conicum. Irradiation of the esophagus is invaluable in many cases and should not be forgotten as a possible factor in obstruction through diverticula, carcinoma, etc. The cooperation between endoscopy and the roentgen ray has brought about a great advance in the diagnosis of chronic stenoses of the airways.

Treatment for Dyspnea.—In asphyxia resuscitation should be obtained by removal of the foreign bodies, water, food, vomitus, etc., followed by artificial respiration. In aspiration of all sorts, low tracheotomy and suction are necessary. For ordinary practice and lay use, the Schafer method is advised; for operation, the Sylvester method. The treatment should be combined with massage of the heart, traction of the tongue, phrenic stimulation, intracardial injections of epinephrine, stretching of the sphincter ani, etc. If there is time for investigation, one should determine the etiologic factor, especially whether the condition is cardiac or respiratory, as damage may be done by polypragmatic methods. The best known respiratory stimulant is the inhalation of an oxygen carbon dioxide mixture; other stimulants are lobeline, camphor, strychnine, caffeine and epinephrine. Overdoing artificial respiration may lead to acapnia; it should be stopped occasionally to test whether it is necessary further. The appearance of indubitable

"death spots" on the dependent parts, according to the Vienna school, is a sign of death. In many cases of asphyxia, especially that from electric shock, artificial respiration should be continued for many hours, and is best done by mechanical aids.

Whenever possible, the exact diagnosis of acute dyspnea, orthopnea or choking spells should precede treatment. In acute inflammatory and other self-limited conditions conservative measures should prevail; if the stenosis is laryngeal, intubation should be given preference over tracheotomy, especially in children, in whom decannualization is difficult. For acute choking, morphine, or modern substitutes, is desirable, but should be given with caution and under constant observation, and is best combined with respiratory stimulants (lobeline, etc.). Oxygen alone or combined with carbon dioxide, is used if practicable. In acute edemas, cold applications or leeches without and sprays of epinephrine, with or without pituitary extract and preferably in oily menstruum, are now preferred to scarification. Emetics may be effective in children; calcium may be used to obviate spasm of the glottis, and alkaline inhalations to liquefy the secretions. Intubation is preferred when it is practicable, but in emergency incision of the cricothyroid membrane is preferable to the more dangerous tracheotomy.

If the obstruction is lower, intubation by the tracheoscope should be employed, especially during strumectomy, but preferably tracheotomy inferior before the operation. In aneurysm, venesection and sprays of epinephrine are advised. The tracheoscope may be used with utmost caution. The sternum is resected. In chronic stenosis that may lead to sudden dyspnea, careful after-care should be given, after investigation of the circulatory system; tracheotomy should be performed early.

The ideal treatment for chronic dyspnea is the removal of a foreign body or of a tumor from within the air passages, or the compression caused by them from without, but this is not often possible; even after such operations, the conditions may become worse. Here the sovereign remedy is tracheotomy, but it must be definitely indicated in order to be useful.

Expectorants, iodine, ammonia and pilocarpine hydrochloride are used; in hypersecretion (seldom in stenoses), balsams, atropine and scopolamine. If the dyspnea is of spastic or reflex origin, sedatives are useful, but the habit-forming alkaloids of opium should be avoided. A moist climate and low altitudes (not over 800 meters), especially a warm seashore, are recommended. The avoidance of exertion and spasm-inducing stimuli and keeping the nasal respiration free are helpful. Careful watch should be kept for sequelae, and they should be recognized early in the lungs, heart, kidneys, etc., to avoid further advance.

Marschik advised chloroform-oxygen anesthesia in cases suitable for surgical intervention (foreign bodies, papilloma, biopsy, operation for struma). The danger of postoperative collapse or adduction stenosis should be kept in mind. Intubation is done to prevent postoperative stenosis. Irradiation is carried out when a lymphoma is present. Struma, persisting thymus and mediastinal tumor are liable to increase stenosis.

Tracheotomy is always the safety valve, but there should be definite indications for its employment, and the patients should be encouraged to use the larynx (speaking cannula). This applies especially to double posticus paralysis. Tracheostomy may be substituted. Many patients learn to close the tracheostoma by action of the muscle.

In carcinoma of the larynx tracheotomy may be followed immediately by radical extirpation, but in old people and in persons with cardiac disease or defective lungs, preliminary tracheotomy (eight days) is preferable, although this involves some danger in regard to aseptic healing.

There are two methods of treatment for chronic stenosis due to disease of the laryngeal wall: either progressive or plastic dilatation, and eventually resection. The first method requires care and patience, and is most suitable when scar tissue is present; it is less suitable for chronic granulation stenosis, lupus, scleroma and lepra, and least for stenoses caused by drug addiction after perichondritis, ary-

arytenoiditis, posticus paralysis and compression. In trauma it is better to produce "chronic" dilatation immediately than to do it after scar formation. Dilatation is made from above by catheter, Schroetter tubes or intubation tubes. All of these tubes have advantages and disadvantages. In patients on whom tracheotomy has been performed dilatation is produced with T-cannulas of the proper lumen. The adjuvants used are: electrolysis, fibrolysin, endoscopic excision or discission of scars, galvanocautery and especially diathermy. In deep stenoses the catheter, the conical tubes or the biscuit tubes (Schroetter, Bruenin,) and the aforementioned adjuvants are used.

There are many methods of laryngostomy: the more radical handling of the soft parts of the larynx to get sufficient lumen consists of excision of the vocal bands, removal of the arytenoid cartilages, submucous resection of the soft parts; plastic operation on the mucous membranes for large defects with grafts (Gluck, Sorenson); Thiersch graft (Gersuny), and resection of the laryngeal cartilage, also without laryngofissure (Gluck, Sorenson, Lang). Frequently minor operations on the trachea are necessary, such as removal of granulation or scar tissue and also larger excisions with Thiersch grafts; resection of the subperichondrial cartilage may be necessary. Especially difficult are the indications and operations in tracheomalacia (Bicherson suture preferred).

In resection of the trachea, not more than four or five rings may be resected. If a more extensive procedure is necessary, a plastic operation must be performed.

Decannulation, followed by a plastic operation, is performed as soon as possible in cases of foreign bodies, subglottic swelling and acute edema of the larynx, but in other conditions this procedure should be carefully considered: the use of speaking cannulas, T-cannulas, sieve cannulas and tracheostomy to retain function while playing safe. Marschik described methods for the gradual discarding of the cannula.

The presenter thinks that the best plastic operation is Mangoldt's (rib cartilage). Other operations, dangers and complications are discussed. Building up the larynx and inversion of the glottis, rather than resection, are described. Two cases were demonstrated, one showing a tendency of the cannula to move upward; cricoid cartilage decubitus resulted from pressure of the tube, with a tendency to move upward into the niveau of the conical ligament. In the second case, tracheostomy was performed after extirpation of the larynx. On the one hand, there was a possibility of stenosis from perichondritis and peritracheal scar, and on the other hand, the possibility through practice in closing the tracheostoma by muscle action to develop the pseudopharyngeal voice.

Book Reviews

DISEASES OF THE EAR, NOSE, AND THROAT, MEDICAL AND SURGICAL. By WILLIAM L. BALLENGER, M.D. Revised by H. C. Ballenger, M.D. Price, $11. Pp. 1138, with 583 engravings and 29 plates. Philadelphia: Lea & Febiger, 1930.

This is the second revision of the treatise by H. C. Ballenger. The first revision was reviewed in the ARCHIVES in January, 1926. The first revision made by the present author showed a decided improvement over previous editions. The present volume is a vast improvement. Many of the bizarre features of the original text have been revised or left out entirely. Valuable chapters have been added, one by G. Tucker and Chevalier L. Jackson on bronchoscopy and another by A. Lewy on the labyrinth.

The book is rather cumbersome, consisting of 1,138 pages with 583 engravings and 29 plates. The style is rather rambling with a superfluity of repetitions, some subjects being discussed with slight variations in several places. The cullings from the literature in the present volume show, on the whole, a better appreciation of the evalution of published articles than was apparent in the first editions, in which the aim seemed to be to give prominence to any bizarre ideas rather than to exercise judicious discrimination of the authors quoted.

The aim is apparently to present in one volume a comprehensive statement of as many views as can be collected relating to otolaryngology, and no condition is too rare or unknown as not to be included. We foresee for the present edition a continuation of the popularity with which the earlier editions were received.

Directory of Otolaryngologic and Ophthalmologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. T. E. Carmody, 227, 16th St., Denver.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Philadelphia. Time: 1931.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
President-Elect: Dr. J. F. Barnhill, Miami Beach, Fla.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Chicago. Time: Oct. 27-31, 1930.

American Bronchoscopic Society

President: Dr. Henry B. Orton, 24 Commerce St., Newark, N. J.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.

American Laryngological Association

President: Dr. Francis R. Packard, 304 S. 19th St., Philadelphia.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.

American Laryngological, Rhinological and Otological Society

President: Dr. Max A. Goldstein, 3858 Westminster Pl., St. Louis.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.

American Otological Society

President: Dr. David H. Walker, 101 Bay State Rd., Boston.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

SECTIONAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. G. G. Marshall, 122 West St., Rutland, Vt.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Owen Smith, 690 Congress St., Portland, Maine.
Secretary-Treasurer: Dr. Stanwood Fisher, 192 State St., Portland, Maine.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Arthur C. Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Victoria, B. C.. Time: Sept. 3-5, 1930.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

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Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Fred Hasty, 119 Seventh Ave., Nashville, Tenn.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Louisville, Ky. Time: November, 1930.

SOUTHWESTERN MICHIGAN TRIOLOGICAL SOCIETY

President: Dr. Wilfrid Haughey, 65 W. Michigan Ave., Battle Creek.
Secretary: Dr. R. H. Fraser, Battle Creek Sanitarium, Battle Creek.
Time: Third Thursday of alternate months.

STATE

COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. C. E. Cooper, 227, 16th St., Denver.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

EYE, EAR, NOSE AND THROAT CLUB OF GEORGIA

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. H. A. Van Osdol, 320 N. Meridian St., Indianapolis.
Secretary: Dr. Robert J. Masters, 23 E. Ohio St., Indianapolis.
Place: Indianapolis. Time: December 10 and 11, 1930.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY

President: Dr. Lee W. Smith, 125 W. Granite St., Butte.
Secretary: Dr. J. G. Parsons, Lewistown.
Time: Semi-annually.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. H. B. Beeson, 232 W. De Mers Ave., Grand Forks.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. J. W. McCollom, 346½ Washington St., Portland, Ore.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland, Ore.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

RHODE ISLAND OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. J. E. Raia, 272 Broadway, Providence.
Secretary: Dr. F. W. Dimmitt, Jr., 195 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

UTAH OPHTHALMOLOGICAL SOCIETY

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

VIRGINIA SOCIETY OF OTOLARYNGOLOGY AND OPHTHALMOLOGY

President: Dr. Fletcher D. Woodward, Box 162, University.
Secretary-Treasurer: Dr. Henry Grant Preston, Harrisonburg.

LOCAL

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. William L. McDougall, Atlanta National Bank Bldg., Atlanta.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

BALTIMORE CITY MEDICAL SOCIETY, SECTION ON OTOLOGY AND LARYNGOLOGY

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Samuel Salinger, 25 E. Washington St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Edward D. King, 707 Race St., Cincinnati.
President-Elect: Dr. Samuel Seltz, Provident Bank Bldg., Cincinnati.
Secretary-Treasurer: Dr. Donald Lyle, 19 W. 7th St., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

CLEVELAND ACADEMY OF MEDICINE, SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Chairman: Dr. M. Paul Motto, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederic M. Strouse, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Columbus Ophthalmological and Otolaryngological Society

Chairman: Dr. John E. Brown, 370 E. Town St., Columbus, Ohio.
Secretary-Treausurer: Dr. Albert D. Frost, 681 E. Broad St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. H. B. Decherd, 1717 Pacific Ave., Dallas, Texas.
Secretary: Dr. W. Mood Knowles, 1717 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Oto-Laryngological Society

President: Dr. C. C. McClelland, David Whitney Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. W. R. Thompson, 510 Main St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. Claude C. Cody, 1306 Walker Ave., Houston, Texas.
Secretary: Dr. J. M. Robinson, Eye, Ear, Nose and Throat Hospital, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. E. L. Lingeman, 241 N. Pennsylvania St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. A. E. Eubank, Arygle Bldg., Kansas City, Mo.
Secretary: Dr. O. S. Gilliland, Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. Dean E. Godwin, Security Bldg., Long Beach, Calif.
Secretary-Treasurer: Dr. Ferris Arnold, Security Bldg., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. A. Ray Irvine, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of each month.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. James A. Flynn, 1511 Rhode Island Ave., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. R. J. Warner, 706 Church St., Nashville.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otological Society

President: Dr. William A. Wagner, Pere Marquette Bldg., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. John M. Loré, 240 West End Ave., New York.
Secretary: Dr. Robert E. Buckley, 2 E. 103rd St., New York.
Place: 103d St., and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Arthur J. Wagers, 1429 Spruce St., Philadelphia.
Secretary: Dr. Herman B. Cohen, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. Watson Marshall, 121 University Pl., Pittsburgh.
Secretary-Treasurer: Dr. Thomas B. McCollough, 121 University Pl., Pittsburgh.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. George E. Hourn, 607 N. Grand Blvd., St. Louis.
Secretary: Dr. Arthur M. Alden, Frisco Bldg., St. Louis.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. W. Sorrell, Gibbs Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. A. F. Clark, 728 Main Street, San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. A. N. Codd, 421 W. Riverside Ave., Spokane, Wash.
Secretary: Dr. Marc Anthony, Old National Bank Bldg., Spokane, Wash.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. Searle B. Marlow, State Tower Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.